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About Authors

■ *Last fall,* DON R. BERLIN *(M '39) was named coordinator of military airplane engineering of the Curtiss-Wright Corp., advancing from the post of chief engineer of the organization's Curtiss Aeroplane Division, which he had held since 1936. From the time of his employment in the engineering department of the U. S. Army Air Corps at McCook Field, Dayton, Ohio, immediately after receiving his B.S. degree in Mechanical Engineering from Purdue University in 1921, Mr. Berlin has been engaged in aircraft engineering, holding important posts with Douglas, Northrop, and Stearman. He joined the Curtiss Aeroplane & Motor Co., Inc., predecessor of the Curtiss Aeroplane Division, in 1934.*

■ DR. OSCAR C. BRIDGEMAN *(SM '30) followed graduation from Harvard University in 1925 with the degree of Ph.D. in physical chemistry, with two years at M.I.T. as a National Research Fellow, working on thermodynamic problems. In 1927, Dr. Bridgeman became associated with the National Bureau of Standards as a research associate, working in the automotive powerplant section on fuel problems. In 1931 he was made chief of the Lubrication and Liquid Fuels Section. Since that time he has been engaged in both lubrication and fuel research. Dr Bridgeman received the Manly Memorial Medal from the SAE in 1930 for his paper on airplane vapor lock.*

■ J. B. COOPER, *as chief of the mechanical equipment unit of Boeing Aircraft Co., is in charge of research and design in connection with the development of airplane heating and ventilation, cabin supercharging, and hydraulic systems. Currently, he is actively engaged in the study of mechanical and physiological problems relating to high-altitude aircraft. Mr. Cooper joined Boeing as cabin-supercharging engineer in 1937, and participated in the design and testing of cabin-supercharging*

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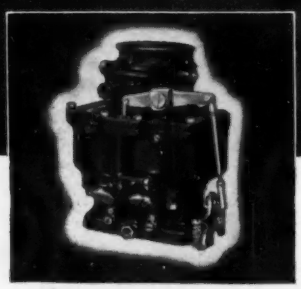

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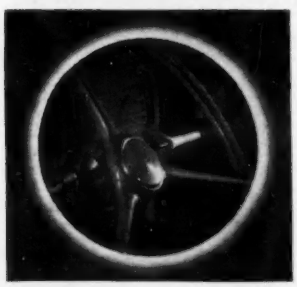

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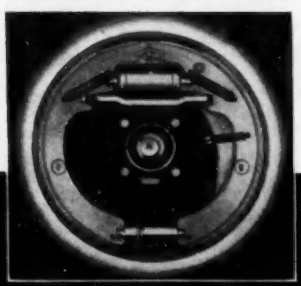

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RELATION between Engineering and Production

by B. D. KUNKLE
Vice President, General Motors Corp.

B. D. Kunkle

IN the development of new apparatus or the improving or perfecting of existing devices, the engineer's problems can be approached in one of two ways: (1) he may seek a satisfactory answer to an existing problem, with little or no regard for a solution from the standpoint of manufacturability; or (2) he may consider how the device or improvement can be developed to lend itself to the simplest and most efficient manufacturing processes.

Illustrating the first of these points, I recall an experience when I was a plant superintendent quite a few years ago. It was my custom at lunch time to join other members of the organization who worked with engineering or productive processes. On this particular day, there was a young engineer in the group who had considerable ingenuity. He was looked upon as having much promise. In the course of the conversation I said to him: "Well, some day when you have a few minutes, come down to my office and I will be glad to go through the plant with you. You may get a better knowledge of some of our manufacturing processes and problems."

I was rather stunned by his reply. He said: "Oh, I don't believe that would be a very good thing to do. If I knew more about the manufacturing processes, it might limit my thinking so far as design is concerned. That would prevent my going ahead with some designs that might be desirable yet not well adapted to existing processes."

I made no response because it was a rather new thought to me and I felt that the young man must have some reason for feeling as he did. However, I served for a number of years with this same organization, and I never saw anything of particular importance that this engineer brought through for production.

■ Manufacturing Angles Important

This young man's feeling is not shared by a majority of the engineers of my acquaintance. After all, good engineering consists not only in arriving at a solution of a problem, but in arriving at a solution which permits adaptation to good manufacturing procedure. I don't mean that this rule should be applied 100%, particularly in the development of new apparatus, or that manufacturing processes should be considered as finished and the development of equipment at a standstill. If this were true, no new developments could be made unless they adapted themselves to current manufacturing equipment or processes.

However, it is my observation that those engineers who have a good grasp of the problems involved in manufacture are the most successful. They are the engineers whose product developments stand up best in service. If we are to progress, it means that there must be departure from what we have been doing. If we are to develop apparatus to perform new functions, it goes without saying that these developments often will lead into fields which require corresponding development in material and in productive equipment. I believe that in the automotive industry this particular thing is done to a greater degree than is ordinarily practiced. The matter of being different, however, I feel is frequently carried to extremes. It often occurs that in basic apparatus, engineers sometimes feel that they just cannot accept the design arrived at by other engineers dealing with the same problem.

I recall a number of years ago in our own Corporation a strike was threatened in a supplier's plant which seriously affected every one of our car divisions. To see what could be done to remedy the situation, our first move was to obtain samples of this particular mechanism as supplied to each of the divisions involved. When all of these

[This paper was presented at a Detroit Section Meeting of the Society, at Flint, Mich., April 14, 1941.]

samples were assembled, certain variations were in evidence in every one of the devices being used, although the automobiles themselves in many cases were very close to the same general dimensions and weight. Perhaps it would be more helpful to be specific about the matter. It had to do with hydraulic brakes. Although the variations in some cases were relatively small, nevertheless, sufficient change was involved in each case as to make it impossible to adapt the same part to two different automobiles, even though their approximate weight and dimensions were the same.

Sometimes it is difficult to understand when a unit of this kind performs satisfactorily on one car why it is not possible to adopt it practically as it is for use in another car of the same general characteristics. A number of times I have been a party to an organized effort toward standardization of certain types of equipment. It has been interesting to see the resistance encountered and the lack of effort on the part of engineers in one particular group to accept and apply a device which has been thoroughly proven on another car, in the form that it is then being manufactured and used.

I am in entire sympathy with the idea that if all models were to have identically the same appearance and equipment there would be little reason to have more than one model. To serve the public, we must have a wider selection to meet requirements in appearance and performance. However, I am still sold on the idea that where several types of apparatus perform an identical function, much more can be done by agreeing on and adopting a satisfactory standardized product than to insist on variations that require substantial differences in materials and tools. The latter method makes it impossible to make available to a second user parts that otherwise should be entirely satisfactory, and, incidentally, to supply such parts at lower cost because of the elimination of tools and duplicate equipment.

An outstanding example of variety of design is automotive electrical equipment. As you go through one of our electrical equipment plants, it is interesting to see the very wide variations required in mounting and application on devices which are identical as to performance characteristics.

■ Standardization Reduces Costs

I recognize that factors often influence a situation which the engineer feels are somewhat beyond his control. This applies particularly to the design of such parts as may fall in the area of substantial service replacement. Every manufacturing organization is jealous of its ability to furnish the parts for replacement required on their own products and sometimes variations are introduced purely for commercial reasons. It is particularly timely to bring up this subject at the moment because we are facing grave economic readjustments. It would seem to me that our engineers should take time by the forelock, set aside some of the things that influence differences other than performance requirements, and move toward adapting parts that have proved satisfactory in use without troublesome variations. By so doing, they could reduce cost and increase availability.

There are other factors, of course, which influence this same situation. We do have trouble with certain types of apparatus at times. Frequently, the tendency is to resort to complete changes rather than to adopt modifications which have proved themselves satisfactory in other applications of the same apparatus.

I have been intensely interested in looking over the parts of one of our automobile units, particularly in respect to the ease of their manufacture. A corner reinforcing plate, for instance, may be made of such a shape as to be very difficult to draw, and of such a form, so far as trim is concerned, as to involve dies which are rather difficult to maintain. It is here that close cooperation between the engineering and manufacturing divisions gives its best evidence in the final results. Where an engineer is willing to accept the counsel of an experienced manufacturing man, it frequently happens that some small modification in the design of a given part reduces its cost and simplifies the tooling problem. In looking at a piece of finished apparatus, it is easy enough for anyone experienced in manufacturing to detect just the thing that I am talking about, because such a situation is more apparent from physical evidence than in any other way. Most of our engineers are broadminded enough so that – after a reasonable effort on the part of the manufacturing unit to demonstrate that the design lacks something in the matter of being practical – they will make modifications in no way harmful to the part itself which render it much easier to produce. Whatever is done along this line usually reduces loss and results in a better product.

■ Exhibit Helps Designers

Several years ago, as a result of a conference with C. E. Wilson, General Motors organized a special staff department known as the Material Utilization Department. An exhibit room was established where certain parts of outstanding merit might be seen by individuals in our engineering, manufacturing, and cost accounting departments. It has been extremely gratifying to see the number of people who have taken advantage of this opportunity. This department was intended to make our divisional units more conscious of the need for a thorough study in the application of materials to insure use of the most economical material satisfactory for the service required. At the same time, these outstanding examples in the exhibit were available for study by designated representatives in each one of the plants.

This operation, of course, was very limited, and in no way attempted to suggest modifications or procedures on any parts. It was merely a Show-Me Department which still operates in connection with our manufacturing section. In this department men can see the results of special developments carried out by certain divisions. Cooperation in this work has been outstanding and many substantial savings have been made, not as a result of the work that this department did, but rather as a result of the stimulated thinking on the part of the men assigned to this work.

Many small parts show how a little more study by specification engineers might result in substantial savings. I have in mind a study which was conducted on such simple things as bolts and screws. Standard parts of given dimensions are more or less in universal use in these particular products. Consequently, production facilities can be operated most efficiently. However, in the case of one user a certain material was specified, while, in the same application for a bolt of the same size, a different material was specified by another manufacturer. It is easy to see

how variations like this develop because the man who writes the specifications for such standard parts – unless he is specifically instructed by the engineer in charge – will use material that he feels is most satisfactory for the job. This applies particularly to manufacturing having a relatively high or low tensile strength and other characteristics. When the facts were actually laid before the divisions using the product, it was admitted that the material specifications on some of these parts were far more rigid than actual requirements and service justified. Some divisions were paying thousands of dollars more than other divisions for standard parts of this character because no particular attention had been paid to material specifications. It is impossible to study all parts in the same detailed manner that these parts were studied, but enough evidence was accumulated to stimulate thinking on what might be done along these lines.

When the men responsible for production actually observe the number of operations being done on the parts as compared to parts of the same type manufactured by other suppliers, it is possible to make adjustments so that certain special operations can be eliminated and production brought more nearly to standard practice of other manufacturers.

Because of the defense program, much intensive study is under way at the present time dealing with the necessary substitution of materials. It is my prediction that in many instances the so-called substitutes eventually will be equal to, if not better than, the original parts used. When and if the pressure for these original materials is relieved, there will be little tendency to return to them, although at one time they were regarded as absolutely necessary to the manufacture of the parts in question.

■ Production Problems Recognized

It is my feeling that responsible engineers today are recognizing these simple fundamental things which I have enumerated. More and more the tendency at the time of the conception of the design will be to search diligently for materials which will be satisfactory for the job at the lowest cost and greatest availability. Furthermore, in the fabrication of the parts involved, manufacturing departments will be consulted constantly for possible modifications of tools and tool equipment so that these parts will be least expensive and least complicated for good production. This, I sincerely believe, is the tendency in our present day engineering. I hope that it may be not only the casual but the universal practice in all organizations.

■ Personality Affects Cooperation

While it may seem beside the subject, nevertheless I believe that the satisfactory doing of all these things depends to a considerable extent on the personalities of the individuals involved. Sometimes an engineer does not get very satisfactory cooperation out of a manufacturing department, or a manufacturing department gets equally little consideration from the engineer on certain modifications that in themselves have little to do with the actual functioning of the part. It goes without saying that the best results can be obtained only when there is an honest effort on the part of the engineer and manufacturer to cooperate. The time to do this is when the parts are in process of design. It is not asking too much that, when the characteristics of a design are once established, men from the manufacturing department be brought into consultation with engineers so that the best results can be obtained with the least change in design and the least delay in production. Frequently, a part will go into the shop for manufacture when the shape is extremely difficult to handle and an excessive amount of scrap results. This makes it necessary to spend considerable time and effort in the repair of defective parts. The answer is obtained only by going through the antagonizing experience of starting the parts in production in this way, and then because of the loss involved to seek such modifications in the part itself as will provide less difficult processing and much smaller manufacturing loss.

If there is anything that I would like to emphasize, it is this particular practice. Any organization can profit by having the kind of an understanding between its engineering and manufacturing departments which will lead, not to a compromising of designs, but to the making of such designs as will insure efficient manufacture and the maximum of satisfactory service.

SAE Coming Events

June 1 – 6 — Summer Meeting
The Greenbrier – White Sulphur Springs, W. Va.

■

Sept. 25 – 26 — National Tractor Meeting
Schroeder Hotel – Milwaukee, Wis.

■

Oct. 23 – 24 — National Fuels & Lubricants Meeting
Mayo Hotel – Tulsa, Okla.

■

Oct. 30 – 31 & Nov. 1 — National Aircraft Production Meeting
Biltmore Hotel – Los Angeles, Calif.

Milwaukee – June 13

Westmoor Country Club; dinner 6:30 p. m. Annual Spring Dance.

Northern California – June 10

Hotel Bellevue, San Francisco; dinner 6:30 p. m. Open Forum on Transportation and Maintenance.

Pittsburgh – June 17

St. Clair Country Club. Golf 3:00 p. m. Dinner-dance 6:30 p. m.

St. Louis – June 10

Closing dinner.

Southern California – June 13

Elks Club, Los Angeles; dinner 6:30 p. m. Classical Use of Aircraft-Engine Power at Altitude Curves – Capt. Allan Barrie, Western Air Lines.

Chemical Compositions of SAE STEELS REVISED

COMPREHENSIVE revisions of SAE steel specifications have just been published. Turning back the tide of increasing variations in the chemistry of steels demanded by users in recent years, the revised standards provide for 72 carbon and alloy grades and 12 corrosion and heat-resisting alloys – a total of 84 in place of the 109 SAE standard steels included in the series which they replace.

The revised series (which appears in the 1941 SAE Handbook published just a few days ago) is the result of nearly a year's work by the Iron and Steel Division of the SAE Standards Committee, the last previous general revision in these specifications having been made in 1935. Carrying out the present important revisions, Division Chairman F. P. Gilligan sought and obtained data on use of SAE steels from machine tool builders, electrical manufacturers, railroads, and scores of other non-automotive users as well as from every part of the automotive industry itself. Final decisions were reviewed in cooperation with a technical committee of the American Iron and Steel Institute which had recently completed a survey restricted to steel producers and, in general, the conclusions reached by the two sepa-

MANGANESE STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.
Primary	Secondary				
1330	....	0.25–0.35	1.60–1.90	0.040	0.050
1335	....	0.30–0.40	1.60–1.90	0.040	0.050
1340	....	0.35–0.45	1.60–1.90	0.040	0.050
....	1350	0.45–0.55	1.60–1.90	0.040	0.050

NICKEL STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Nickel Range
Primary	Secondary					
2315	....	0.10–0.20	0.30–0.60	0.040	0.050	3.25–3.75
2330	....	0.25–0.35	0.50–0.80	0.040	0.050	3.25–3.75
2340	....	0.35–0.45	0.60–0.90	0.040	0.050	3.25–3.75
2345	....	0.40–0.50	0.60–0.90	0.040	0.050	3.25–3.75
....	2515	0.10–0.20	0.30–0.60	0.040	0.050	4.75–5.25

NICKEL CHROMIUM STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Nickel Range	Chromium Range
Primary	Secondary						
....	3115	0.10–0.20	0.30–0.60	0.040	0.050	1.00–1.50	0.45–0.75
3120	....	0.15–0.25	0.50–0.80	0.040	0.050	1.00–1.50	0.45–0.75
....	3130	0.25–0.35	0.50–0.80	0.040	0.050	1.00–1.50	0.45–0.75
3135	....	0.30–0.40	0.50–0.80	0.040	0.050	1.00–1.50	0.45–0.75
3140	....	0.35–0.45	0.60–0.90	0.040	0.050	1.00–1.50	0.45–0.75
X3140	....	0.35–0.45	0.60–0.90	0.040	0.050	1.00–1.50	0.60–0.90
3145	....	0.40–0.50	0.60–0.90	0.040	0.050	1.00–1.50	0.45–0.75
3150	....	0.45–0.55	0.60–0.90	0.040	0.050	1.00–1.50	0.45–0.75
....	3215	0.10–0.20	0.30–0.60	0.040	0.050	1.50–2.00	0.90–1.25
....	3220	0.15–0.25	0.30–0.60	0.040	0.050	1.50–2.00	0.90–1.25
....	3240	0.35–0.45	0.30–0.60	0.040	0.050	1.50–2.00	0.90–1.25
....	3245	0.40–0.50	0.30–0.60	0.040	0.050	1.50–2.00	0.90–1.25
....	3250	0.45–0.55	0.30–0.60	0.040	0.050	1.50–2.00	0.90–1.25
3312	....	max. 0.17	0.30–0.60	0.040	0.050	3.25–3.75	1.25–1.75
....	3415	0.10–0.20	0.30–0.60	0.040	0.050	2.75–3.25	0.60–0.95

[1] Silicon range of all SAE basic open hearth alloy steels shall be 0.15–0.30. For electric and acid open hearth alloy steels, the silicon content shall be 0.15 minimum.

MOLYBDENUM STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Chromium Range	Nickel Range	Molybdenum Range
Primary	Secondary							
X4130	....	0.25–0.35	0.40–0.60	0.040	0.050	0.80–1.10	....	0.15–0.25
4140	....	0.35–0.45	0.60–0.90	0.040	0.050	0.80–1.10	....	0.15–0.25
4150	....	0.45–0.55	0.60–0.90	0.040	0.050	0.80–1.10	....	0.15–0.25
4320	....	0.15–0.25	0.40–0.70	0.040	0.050	0.30–0.60	1.65–2.00	0.20–0.30
X4340	....	0.35–0.45	0.60–0.90	0.040	0.050	0.60–0.90	1.65–2.00	0.20–0.30
4615	....	0.10–0.20	0.40–0.70	0.040	0.050	....	1.65–2.00	0.20–0.30
4620	....	0.15–0.25	0.40–0.70	0.040	0.050	....	1.65–2.00	0.20–0.30
4640	....	0.35–0.45	0.50–0.80	0.040	0.050	....	1.65–2.00	0.20–0.30
4815	....	0.10–0.20	0.40–0.60	0.040	0.050	....	3.25–3.75	0.20–0.30
4820	....	0.15–0.25	0.40–0.60	0.040	0.050	....	3.25–3.75	0.20–0.30

CHROMIUM STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Chromium Range
Primary	Secondary					
5120	....	0.15–0.25	0.60–0.90	0.040	0.050	0.60–0.90
5140	....	0.35–0.45	0.60–0.90	0.040	0.050	0.80–1.10
5150	....	0.45–0.55	0.60–0.90	0.040	0.050	0.80–1.10
52100	....	0.95–1.10	0.20–0.50	0.030	0.035	1.20–1.50

CHROMIUM VANADIUM STEELS[1]

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Chromium Range	Vanadium	
Primary	Secondary						Min.	Desired
....	6135	0.30–0.40	0.60–0.90	0.040	0.050	0.80–1.10	0.15	0.18
6150	....	0.45–0.55	0.60–0.90	0.040	0.050	0.80–1.10	0.15	0.18

SILICON MANGANESE STEELS

SAE No.		Carbon Range	Manganese Range	Phosphorus, Max.	Sulfur, Max.	Silicon Range
Primary	Secondary					
9250	....	0.45–0.55	0.60–0.90	0.040	0.050	1.80–2.20
9260	....	0.55–0.65	0.60–0.90	0.040	0.050	1.80–2.20

[1] Silicon range of all SAE basic open hearth alloy steels shall be 0.15–0.30. For electric and acid open hearth alloy steels, the silicon content shall be 0.15 minimum.

rate groups with respect to popular and desirable SAE compositions were similar.

"It is the belief of the Iron and Steel Division," Mr. Gilligan says, "that the needs of the automotive and general user are adequately met with this revised list – and that this first and substantial step in the direction of simplification will inspire a determination on the part of both steel makers and steel users to seek a further diminution in varieties, to the end that increased volume in fewer production streams will facilitate more rapid deliveries and insure lower steel costs for all users."

These revised SAE steel specifications have been listed under two headings: "Primary" and "Secondary." "Primary steels" are those used in substantial quantities; "secondary steels" are those considered essential by certain users, but not used extensively. This listing will indicate to users the limited-source materials and encourage them, where practicable, to adopt a primary steel for their purpose.

The accompanying tables give the chemical compositions of SAE steels as they appear in the 1941 SAE Handbook.

The composition limits of SAE steels apply to the steels as delivered to the purchaser. The Iron and Steel Division has not approved any chemical tolerances beyond these limits.

CARBON STEELS

SAE No.		Carbon Range	Manganese Range	Phosphorus Max.	Sulfur Max.
Primary	Secondary				
1010	....	0.05–0.15	0.30–0.60	0.045	0.055
1015	....	0.10–0.20	0.30–0.60	0.045	0.055
X1015	....	0.10–0.20	0.70–1.00	0.045	0.055
1020	....	0.15–0.25	0.30–0.60	0.045	0.055
1020	....	0.15–0.25	0.70–1.00	0.045	0.055
1025	....	0.20–0.30	0.30–0.60	0.045	0.055
....	X1025	0.20–0.30	0.70–1.00	0.045	0.055
1030	....	0.25–0.35	0.60–0.90	0.045	0.055
1035	....	0.30–0.40	0.60–0.90	0.045	0.055
1040	....	0.35–0.45	0.60–0.90	0.045	0.055
1045	....	0.40–0.50	0.60–0.90	0.045	0.055
1050	....	0.45–0.55	0.60–0.90	0.045	0.055
1055	....	0.50–0.60	0.60–0.90	0.040	0.055
1060	....	0.55–0.70	0.60–0.90	0.040	0.055
....	1065	0.60–0.75	0.60–0.90	0.040	0.055
....	X1065	0.60–0.75	0.90–1.20	0.040	0.055
1070	....	0.65–0.80	0.60–0.90	0.040	0.055
1075	....	0.70–0.85	0.60–0.90	0.040	0.055
1080	....	0.75–0.90	0.60–0.90	0.040	0.055
1085	....	0.80–0.95	0.60–0.90	0.040	0.055
1090	....	0.85–1.00	0.60–0.90	0.040	0.055
1095	....	0.90–1.05	0.25–0.50	0.040	0.055

FREE CUTTING STEELS

SAE No.		Carbon Range	Manganese Range	Phosphorus Range	Sulfur Range
Primary	Secondary				
1112	....	0.08–0.16	0.60–0.90	0.09–0.13	0.10–0.20
X1112	....	0.08–0.16	0.60–0.90	0.09–0.13	0.20–0.30
1115	....	0.10–0.20	0.70–1.00	0.045 max.	0.10–0.20
X1314	....	0.10–0.20	1.00–1.30	0.045 max.	0.10–0.20
X1315	....	0.10–0.20	1.30–1.60	0.045 max.	0.10–0.20
X1330	....	0.25–0.35	1.35–1.65	0.045 max.	0.10–0.20
X1335	....	0.30–0.40	1.35–1.65	0.045 max.	0.10–0.20
X1340	....	0.35–0.45	1.35–1.65	0.045 max.	0.10–0.20

CHROMIUM NICKEL AUSTENITIC STEELS—NOT CAPABLE OF HEAT TREATMENT

SAE No.	AISI[1] Type	Carbon	Manganese, Max.	Silicon, Max.	Phosphorus	Sulfur	Chromium Range	Nickel Range	Molybdenum	Selenium Range	Titanium or Columbium
30615 (type 1)	303	0.15 Max.	2.00	0.75	0.04 Max.	0.18–0.35	17.00–20.00	7.00–10.00	0.60 Max.	....	....
30615 (type 2)	303	0.15 Max.	2.00	0.75	0.12–0.17	0.04 Max.	17.00–20.00	7.00–10.00	0.60 Max.	0.15–0.35	....
30705	321	0.08 Max.	2.50	1.50	0.03 Max.	0.03 Max.	17.00 Min.	8.00 Min.	....	....	0.40[2] Min. 0.70[3] Min.
	347										
30805	316	0.10 Max.	2.50	0.75	0.03 Max.	0.03 Max.	16.00–18.00	10.00–14.00	2.00–3.00	....	....
30905	304	0.08 Max.	2.00	0.75	0.03 Max.	0.03 Max.	18.00–20.00	8.00–10.00	....	....	....
30915	302	0.08–0.15	2.00	0.75	0.03 Max.	0.03 Max.	17.00–20.00	7.00–10.00	....	....	....

STAINLESS CHROMIUM IRONS

SAE No.	AISI[1] Type	Carbon	Manganese, Max.	Silicon, Max.	Phosphorus, Max.	Sulfur	Chromium Range	Nickel Range	Molybdenum, Max.
51210	410	0.08–0.15	0.60	0.50	0.03	0.03 Max.	11.50–13.00	....	....
51310	414	0.08–0.15	0.60	0.50	0.03	0.03 Max.	11.50–13.50	1.25–2.00	....
51335	420	0.25–0.40	0.60	0.50	0.03	0.03 Max.	12.00–14.00	....	....
X51410	416	0.13 Max.	1.20	0.75	0.04	0.18–0.35	12.00–14.00	....	0.60
51710	430	0.12 Max.	0.60	0.50	0.03	0.03 Max.	16.00–18.00	....	....

[1] American Iron and Steel Institute.
[2] Minimum if Titanium is used.
[3] Minimum if Columbium is used.

Report of Iron and Steel Division adopted June 1911. Last revision January 1941.

About SAE Members

The United States will be represented on the new U. S.-Canada Material Coordinating Committee by SAE members **EDWARD R. STETTINIUS, JR.,** director of priorities, OPM, and **WILLIAM L. BATT,** deputy director, Production Division, OPM. The new joint agency has been organized to exchange vital information on strategic raw materials available to each nation. It will consist of four members – two from the United States and two from Canada.

B. C. HEACOCK, president of Caterpillar Tractor Co., Peoria, Ill., has been appointed assistant to Undersecretary of War Robert P. Patterson, to advise on matters pertaining to industrial production. The undersecretary is in charge of all procurement supplies and equipment for the Army.

RALPH E. FLANDERS has resigned his post as executive officer of the OPM tools and equipment group, to resume his duties as president of the Jones & Lamson Machine Co., Springfield, Vt. The tool and equipment group is headed by Dean Dexter S. Kimball.

P. M. IRWIN, formerly sales manager, Dominion Tire Factory, Dominion Rubber Co., Ltd., Ontario, is a lieutenant in the 1st Canadian Troop Carrying Company, Royal Canadian Army Service Corps, Canadian Army Overseas in England.

A. H. FRAUENTHAL, who for five years has been vice president and general manager of the Bantam Bearings Corp., South Bend, Ind., recently resigned in order to establish a new factory in Muskegon to manufacture large special roller and ball bearings, as well as aircraft parts for defense purposes. An authority on design and manufacturing methods, Mr. Frauenthal recently has been acting as consulting engineer for other manufacturers getting started on defense contracts. Prior to becoming associated with Bantam, Mr. Frauenthal occupied positions with General Electric, Chandler, and Studebaker.

Breaks World Record

IGOR I. SIKORSKY, aircraft designer and engineering manager of the Vought-Sikorsky Aircraft Division, United Aircraft Corp., Stratford, Conn., recently piloted a helicopter, of his own design, to a world's endurance record of 1 hr 32 min 30 sec. This smashed the 1 hr 20 min 46 sec former record held by Germany. While considerable engineering refinements are necessary before mass production of helicopters is started, Mr. Sikorsky said, the flight indicated that "fundamentally the machine is there." The record-smashing flight was a realization of a life-long ambition for the world-famous designer, for although he constructed hundreds of giant multi-engined bombers during the World War for the Imperial Russian armies, his earliest aircraft were two unsuccessful helicopters, built in 1909 and 1910.

FREDERICK H. CORP has recently become chief inspector of the Canadian Pacific Airways, St. Hubert Airport, Quebec. He was formerly chief technician, service manager, Canadian Garages Co., Toronto.

R. S. DAMON has been elected president of the Republic Aviation Corp., Long Island. He will remain as vice president and director of American Airlines, Inc., subject to the approval of the Civil Aeronautics Board. Mr. Damon designed and built the first sleeper plane, the Curtiss-Wright Condor, and pioneered mass production of aircraft.

Elected President

R. S. Damon

ALEXANDER KARTVELI, chief engineer of the Republic Aviation Corp., Farmingdale, L. I., was responsible for the design of the spectacular new "Thunderbolt" interceptor – the first 2000 hp single-engine fighter plane built in this country. The combat craft, said to embody every lesson learned under actual fighting conditions in Europe, is described as being heavily armored and equipped with large and small caliber guns. It took only eight months to design and build the Republic XP-47B.

JAMES W. BILLINGS, formerly with the Crane Co., Chicago, has been ordered to active duty as second lieutenant, 442nd Ordnance Company, Boise, Idaho.

ARTHUR J. BRANDT, because of ill health, has resigned as chief of the manufacturing unit in the aircraft section of the Office of Production Management. He is succeeded by H. R. Boyer, president of the Allen Corp., Detroit. Mr. Brandt left his post as president of National Tool Co., Cleveland, to take the OPM position.

ROBERT E. DUNHAM, chief lubrication engineer, Sinclair Refining Co., has resigned to accept the presidency of Sunray Electric, Inc., Warren, Pa. Prior to his Sinclair connection, Mr. Dunham was chief engineer of Hyvis Oils, Inc., which was absorbed by Sinclair.

MARCEL VERNIER, Pratt & Whitney Aircraft's former Bordeaux representative, reached Britain after Dunkirk and has been on the company's service staff in London ever since. He was wounded in a bomb explosion and carries a dozen tiny scars from wounds inflicted by flying glass. "Tell the folks back home that we have had all we wanted to eat so far," Mr. Vernier is reported to have told a newspaper man. "Meat is difficult to get but we manage to get along fine despite the battle of the Atlantic, and no one seems hungry. The spirit of the British workers is fine. There is no question about that, and there doesn't seem to be any doubt in their minds. I don't think any one here is as excited as the folks at home."

W. C. THOMPSON has been named manager of the Detroit Ball Bearing Co.'s recently established branch at Saginaw, Mich. He previously was in charge of the company's Grand Rapids Branch, where he is succeeded by **E. J. MOORE.**

CAPT. GEORGE A. DOOLE, formerly chief pilot, AVIANCA, Pan American Airways, Inc., has been named operations manager for the company at Barranquilla, Colombia, South America.

EUGENE W. WASIELEWSKI, formerly assistant engineer, National Advisory Committee for Aeronautics, Langley Field, Va., is now supercharger project engineer, Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp.

HERBERT V. THADEN has joined the Duramold Aircraft Corp., New York, as manager of the commercial department. Previously he was general manager of the Hayes Mfg. Corp., Grand Rapids, Mich.

ARTHUR H. HERTS is now employed with the British Purchasing Commission as production engineer. He recently came to America from England.

DR. ROBERT J. NEBESAR, chief engineer of the Monocoupe Aeroplane & Engine Corp. since November of last year, has been elected a vice president of the company. He will also continue as chief engineer, and will make his headquarters with the company's Bristol division at Bristol, Va.

Advanced

Dr. Robert J. Nebesar

HORACE A. BEALE, III, is now affiliated with the Mack Mfg. Corp., Allentown, Pa., in the capacity of experimental engineer.

Four SAE members will take part in the ASME Semi-Annual Meeting, Kansas City,

June 16-19, at the Hotel Muehlebach. They are DR. **GUSTAV EGLOFF, E. E. CHAPMAN, C. E. DAVIES,** and **CARL G. A. ROSEN.** A feature on the four-day program will be an engineering quiz on diesel and gas engines under the guidance of Mr. Rosen.

WOLFGANG E. MEYER is affiliated with the Mason Laboratory, Yale University. He was formerly laboratory and research engineer, American Bosch Corp., Springfield, Mass.

L. **CLAYTON HILL** has been made vice president and general manager of the Murray Corp. of America. He was formerly

VP and GM

L. Clayton Hill

vice president in charge of manufacturing. Mr. Hill, chairman of the SAE Quartermaster Corps Advisory Committee, served as assistant general manager of the SAE, from the time of the Armistice until 1925. He is also a former Councilor, a past chairman of the Detroit Section, and present vice chairman of the Passenger-Car Body Activity Committee.

In 1927, Mr. Hill joined the Murray Corp. of America where he soon became works manager and later vice president in charge of all manufacturing activities. Mr. Hill received his B.S.E. from the University of Michigan.

ROBERT D. HARVEY has been ordered to active duty as second lieutenant, Coast Artillery, U. S. Army. He is stationed at Camp Davis, N. C. Lt. Harvey was mechanic in the dynamometer room, Chevrolet Motor Division, General Motors Corp., before being ordered to active duty.

CAPT. HOWARD F. KLEY, Coast Artillery, U. S. Army, is stationed at Fort Barry, Calif. Capt. Kley is on a leave of absence from his post as research engineer with the Shell Oil Co., Martinez, Calif.

WALTER L. GORDEN recently was named chief engineer of the Mall Tool Co., Chicago. He previously was chief engineer of Kissel Industries, Hartford, Wis.

LASKAR WECHSLER, junior mechanical engineer, U. S. Navy Department, Bureau of Ships, has been assigned to duty for a short period at the Electro-Motive Corp., LaGrange, Ill.

ROBERT L. STANLEY, instructor in civil engineering, Union College, has entered the U. S. Army and is stationed with the 5th Signal Battalion (Construction) at Camp Claiborne, Alexandria, La.

RAYMOND A. KIKEN has been named president of the Detroit Cylinder Grinding Co., Detroit. He formerly was president of the Motive Parts Co. of America, Inc., Chicago.

Raymond A. Kiken
Named President

LT.-COM. DANIEL WARD HARRIGAN, formerly assistant air officer, U.S.S. Saratoga, is stationed at the U.S. Naval Reserve Aviation Base, Georgia, as commanding officer.

WILLIAM J. RYAN, JR., formerly sales representative, Ethyl Gasoline Corp., New York, is motor maintenance officer, service company 11th Infantry, U. S. Army, Fort Custer Mich.

R. B. WATSON, JR., has recently become assistant director of port survey, Port Authority, City of St. Petersburg, Fla. He is engaged in engineering and economic survey work on the deep-water port and intracoastal canal. Mr. Watson formerly was special representative for the Chrysler Corp.

"Even now half our output (of military planes) coupled with the British output, exceeds Axis plane production, according to best obtainable estimates," was one of the statements made by **COL. JOHN H. JOUETT,** president of the Aeronautical Chamber of Commerce of America, in an address before the United States Chamber of Commerce.

L. A. COLSTON is now with North American Aviation, Inc., at Inglewood, Calif., as designer (powerplant). He formerly held a similar post with Vultee Aircraft, Inc., Downey, Calif.

ALBERT B. SAXMAN has joined the B. G. Corp., New York, as project engineer. Previously he was with the Coyne & Evans Motor Co., Pittsburgh.

GEORGE E. ROWBOTHAM, formerly a draftsman in the engineering department of Curtiss Propeller Division, Curtiss-Wright Corp., Caldwell, N. J., has been advanced to the post of checker.

O. F. ZAHN, JR., has joined the Shell Oil Co., Inc., as research engineer with its Technical Applications Committee, Martinez, Calif. He was formerly affiliated with the diesel division of the Ex-Cell-O Corp., Detroit.

W. S. FORTNEY, who was superintendent of tires and accessories for Cities Service Oil Co., Fort Worth, Tex., has joined the United Motors Service Co., Inc., Dallas branch, as Delco Battery sales and service engineer.

RICHARD BRECKENRIDGE, Kansas State College student, will take the test course of the General Electric Co.

(*About Members continued on page 23*)

North American Aviation President J. H. Kindelberger stands under the signpost of Kindelberger Road which was named in his honor as a part of the ground-breaking ceremonies for North American Aviation's new $10,000,000 bomber assembly plant at Kansas City, Kan. With him is Frank Holcomb, chairman of the Wyandotte County, Kan., Board of Commissioners

Harold F. Schwedes, upper right, has been named factory manager of the Kansas City plant, coming from California where he was production manager of the company's Inglewood factory

C. J. Gallant, Jr., lower right, recently was named technical consultant and staff assistant to President Kindelberger and Vice President J. L. Atwood. Previously, Mr. Gallant was North American's chief research engineer

MEN FOR TODAY'S JOBS

The SAE Placement Service has available for immediate employment a limited number of men particularly fitted to meet current demands for automotive engineers in both defense and commercial operations. Listed below are men typical of this group.

EAST

AUTOMOTIVE OR EQUIPMENT ENGINEER, with 20 years' experience, desires position in construction, operation and maintenance methods. New York resident; will travel. (4428)

SPECIALIST in executive and sales organizing. He has established close contact with engineers in machine-tool, road and farm equipment industries. Residence, New Jersey. (4574)

TEST AND DEVELOPMENT ENGINEER experienced in laboratory and road testing on engines, chassis and brake linings. Vicinity of southern Connecticut desired. (4284)

DIESEL ENGINEER with 13 years' experience in installation, sales and maintenance of diesel engines; 6 years' instructing, supervising and writing diesel shop courses. Residence —Connecticut. (4618)

CAPABLE EXECUTIVE with recent experience in hydraulic apparatus. Resourceful inventor and competent salesman. Available at once for supervisory position or as developer, coordinator and expeditor. Residence —Connecticut. (4636)

AUTOMOTIVE SERVICE ENGINEER with 15 years' experience covering truck fleet operation, automotive instruction, inspection, parts, labor and accessory merchandising, superservice station layout and management. Residence—New York. (4471)

CAPABLE EXECUTIVE with 28 years' background in design, production, manufacture of engines and automotive equipment. Knowledge of processing and inspection devices. Residence—New York. Northeastern United States preferred. (4608)

MECHANICAL ENGINEER with 5 years' in teaching machine-shop practice and diesel engineering, machine-shop layout and diesel installation, testing and maintenance. Metropolitan New York preferred. (4632)

AUTOMOTIVE FLEET EXECUTIVE with 25 years' experience in purchase, maintenance, safety and cost accounting. Excellent organizer and investigator. New York resident; prefers East. (4639)

FACTORY SUPERINTENDENT with 20 years' experience in automotive equipment, accessories, electrical and mechanical appliances, development, production and sales. Residence—Maryland. (3985)

CHIEF ENGINEER with 17 years' experience in design, development, application and maintenance of automotive electrical accessories. Residence—New England. (4626)

SALES ENGINEER, 35, with thorough technical background and knowledge of economics. Automotive experience includes service and domestic and foreign selling. New York area preferred. (4530)

U. S. Government Needs:

1. Automotive Spare Parts Experts

2. Inspectors of Aeronautical Materials

The United States Civil Service Commission has requested help from the Society to locate candidates for the posts of: Automotive Spare Parts Expert, Office of the Quartermaster General, War Department, $3200 a year; Senior Inspector, Engineering Materials (Aeronautical), Navy Department, $2600 a year; Inspector, Engineering Materials (Aeronautical), Navy Department, $2300 a year; Associate Inspector, Engineering Materials (Aeronautical), Navy Department, $2000 a year; Junior Inspector, Engineering Materials (Aeronautical), Navy Department, $1620 a year.

Competitors will not be required to report for examination at any place but will be rated on the extent of their education, on the extent and quality of their experience relevant to the duties of the position applied for, and on their fitness, on a scale of 100, such ratings being based upon competitors' sworn statements in their applications and upon corroborative evidence.

Details regarding the requirements for the listed positions are on file at SAE Headquarters or may be obtained from the United States Civil Service Commission, Washington, D. C., which will also furnish necessary application forms. Mention the exact title of examination, as given above, in writing to the Civil Service Commission.

MID-WEST

METALLURGIST, who was for 22 years in charge of specification of materials, chemical and physical laboratories, and heat-treatment departments of large automobile concern. Consultant for gear and refrigerator manufacturers. Residence—Michigan— (4073)

PROJECT ENGINEER, design contact man, 30, who has 13 years' accessory, body and chassis experience. Available immediately for midwestern location. (4617)

MANUFACTURING EXECUTIVE. Dartmouth graduate with wide managerial experience. Expert purchasing agent; capable salesman. Chicago area preferred. (4610)

TRANSPORTATION SUPERVISOR, 27 years' experience. Cost accounting, body designing, vehicle specifications, supervision of shop personnel and accident prevention. Residence—Chicago. Will locate anywhere. (4625)

SERVICE MANAGER with 20 years' motor truck experience. Capable of handling service and correspondence and of computing prices. Several years travelling experience. Residence —Indiana. Prefers Midwest or southern United States. (3388)

SALES-SERVICE ENGINEER experienced in production supervision, inspection, and servicing of all types of automotive equipment, as well as sales in oil and automotive industries. Illinois resident; free to travel. (4090)

MECHANICAL ENGINEER with broad experience in all phases of automotive design, testing and production. Residence—Michigan. (4441)

EXECUTIVE versed in good shop practice in automotive and metal working industries. Experienced in factory planning, production control and time study. General knowledge of sales, service and advertising. Residence — Michigan. (4587)

WEST COAST

MANUFACTURING EXECUTIVE, 49. Cost and material control, engineering and production experience with airplanes, diesel engines, automobiles and tractors. West Coast preferred. (4572)

SUPERVISOR of cost estimating and servicing of large fleets. Design, sales and experimental engineering experience. Residence —California. West Coast or Mid-West location desired. (4539)

MECHANICAL SALES ENGINEER with 25 years' experience with large oil company. Residence—California. Will travel.

Write or wire The SAE Placement Service for further information.

(*Continued from page 21*)

F. C. **CRAWFORD,** president of Thompson Products, Inc., has received the Cleveland Chamber of Commerce Medal for public service during the past year.

GEORGE A. TINNERMAN, who with his father, holds more than 100 U.S. and foreign patents on fastenings for mass production industries, has been called to leading

George A. Tinnerman
Mass-Productionist

plants to help step up assemblies. Mr. Tinnerman, vice president and general manager of Tinnerman Products, Inc., Cleveland, concentrates on inventions based on the original "Speed Nut" principle developed by his father, Albert H. Tinnerman.

C. M. **PARSONS,** zone service manager, Pontiac Motor Division, General Motors Sales Corp., Washington, has been transferred to the Chicago branch in a similar capacity.

C. I. **PRESTON,** formerly chief design engineer, Continental Motors Corp., Muskegon, Mich., has become affiliated with Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp.

ELDON J. KELLEY, former sales and service engineer, E. H. White Co., San Francisco, is now sales engineer with the Valley Equipment Co. of that city and San Jose, industrial dealers for International Harvester and Bucyrus-Erie equipment.

P. C. **LONG,** who was assistant chief of inspection, Vultee Aircraft, Inc., Downey, Calif., is now in Wayne, Mich., as superintendent of the Stinson Aircraft Co.

TED LYNN has been named secretary-treasurer of the Burklyn Corp., Burbank, Calif., manufacturers' agents and engineers. He previously was president and general manager of the Plxweve Aircraft Co., Los Angeles.

ROLLIN P. VAN ZANDT has joined the Caterpillar Tractor Co., Peoria, Ill., as designing engineer. He was calculating engineer with the International Harvester Co., Chicago.

J. **ROBERT HETHERINGTON** has joined the Indiana Ordnance Works, Charlestown, Ind., as junior chemist in the explosives division. Mr. Hetherington was a student of the Chrysler Institute of Engineering, Highland Park, Mich.

University of Wisconsin student, **WALTER J. WAGNER,** has been drafted for military duty in the U. S. Army and is stationed at the Cavalry Replacement Center, Troop D, Sixth Training Squadron, Fort Riley, Kan.

C. E. FRUDDEN, executive engineer, tractor division, Allis Chalmers Mfg. Co., Milwaukee, has been elected to serve a three-year term on the Council of the American Society of Agricultural Engineers.

LT. C. D. CASE, formerly assistant production superintendent, U. S. Navy, Assembly & Repair Department, Pensacola, Fla., is now stationed aboard the *U.S.S. Albemarle.*

H. ALAN DUGUID recently joined Vought-Sikorsky Aircraft, Division United Aircraft Corp., as powerplant engineer. Mr. Duguid previously held a similar position with the Glenn L. Martin Co.

ALVIN R. WALKER, formerly research engineer, Tide Water Associated Oil Co., Calif., is employed at the U. S. Navy Yard, Mare Island, Calif., as junior marine engineer.

Announcement that **GLEN T. LAMPTON** has joined its organization recently was made by Hamilton Standard Propellers, Di-

Glen T. Lampton
To Hamilton-Standard Propellers

vision of United Aircraft Corp. Mr. Lampton's post is that of assistant engineer in charge of experimental engineering. Mr. Lampton was engineering manager of the Lycoming Division, Aviation Mfg. Corp.

Vice President

Philip B. Taylor

PHILIP B. TAYLOR, assistant general manager of Wright Aeronautical Corp., Paterson, N. J., was recently elected vice president of the organization. Mr. Taylor joined Wright in 1922 as test engineer and was steadily promoted to higher ranking positions until he became chief engineer. A short while ago he was appointed assistant to the vice president and general manager. Mr. Taylor attended Yale University and was graduated from the Sheffield Scientific School with a Ph.D. in 1920.

STEWART L. MIMS, JR., recently became a cadet at the U. S. Naval Air Station, Jacksonville, Fla.

THOMAS REEVES recently joined the Continental Motors Corp., Muskegon, Mich., as development engineer. Formerly Mr. Reeves was engineer, production and planning department, Hill Diesel Engine Co., Lansing.

HARRIS A. THOMPSON has been named research associate, radiation laboratory, Massachusetts Institute of Technology, Cambridge. Previously Mr. Thompson was electrical engineer with the Holley Carburetor Co., Detroit.

SAE Vice President Inspects Anti-Aircraft Gun Production

E. S. CHAPMAN (center) chief of OPM's Small Arms and Ammunition Division and SAE vice president representing Production Engineering, tours Pontiac plant producing Oerlikon anti-aircraft guns for defense. With him are (left) John G. Painter, OPM, and (right) Rear Admiral W. H. P. Blandy, chief of the Navy Ordnance Bureau

C. W. FAIRBANK, formerly superintendent of maintenance, Colonial-Beacon Oil Co., has been named personnel manager of the company.

F. C. CRAWFORD, president and general manager of Thompson Products, Inc., Cleveland, Ohio, and **BEN F. HOPKINS,** president of Cleveland Graphite Bronze Co., were elected trustees of the Cleveland Engineering Society for the 1941-42 term.

EDGAR R. HERRMANN, formerly methods engineer, Yale & Towne Mfg. Co., Stamford, Conn., is now in the technical training group, B. F. Goodrich Co., Akron, Ohio.

IRVING IRWIN FELDMAN recently joined the Product Engineering Service Co., Detroit, Mich., as assistant chief designer. He was formerly designer, Chevrolet Engineering Division, General Motors Corp., Detroit.

JAMES PETER HUNSAKER, formerly engineering draftsman, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn., is now with American Bosch Corp., Springfield, Mass., as assistant project engineer.

O. M. THORNTON has been named vice president, Titeflex Metal Hose Co., Newark, N. J. Mr. Thornton is Philadelphia branch manager, and for a number of years has been active in the Philadelphia Section.

ALBERT J. KINAST, who received his B.S. degree from the University of Wisconsin with the Class of '40, has joined the Boeing Aircraft Co., Seattle, Wash., as engineer, mechanical equipment unit, hydraulic development.

CHARLES H. JACKSON, formerly a member of the SAE Student Branch at Purdue University, is assistant radio engineer with the U. S. Army Signal Corps, Washington, D. C.

G. L. HARTMAN returns to his former post as assistant engineer of the Superior Coach Corp., Lima, Ohio. He leaves the White Motor Co., Cleveland, where he was assistant engineer in the bus division.

Formerly associate editor of Hearst Magazines, Inc., **GORDON G. ALLAN** recently has become an automotive technician in the engineering department, Camp Holabird, Baltimore, Md.

Among SAE members participating in the program of the fourth Western Metal Congress, sponsored by the American Society for Metals, May 19-23, Los Angeles, were: **H. W. McQUAID,** Republic Steel Corp.; **A. W. WINSTON,** Dow Chemical Co.; **RAYMOND K. BOWDEN,** Carnegie-Illinois Steel Corp.; **CHARLES J. GALLANT, JR.,** North American Aviation, Inc., and **E. K. SMITH,** Electro Metallurgical Co.

W. J. JAMES has changed his occupation from that of tool designer at the Lockheed Aircraft Corp., Burbank, Calif., to assistant marine engineer, U. S. Civil Service, stationed at Mare Island Navy Yard, Calif.

ALFRED R. BOBROWSKY, who recently received his degree of Master of Science in Engineering from the University of Michigan, has been employed by the National Advisory Committee for Aeronautics at Langley Field, Va. He is junior engineer in the engine research section.

Robert Henley Combs

ROBERT HENLEY COMBS, fondly known by his SAE friends as "Bob Combs, the Father of the Canadian Section," died at his Toronto home, April 25. President of the Prest-O-Lite Storage Battery Co. of Canada, Ltd., Mr. Combs was widely known in both automotive and electrical engineering circles. He had been a member of the SAE since 1912, and was active in the American Institute of Electrical Engineers and other professional societies.

Few men have more interests than did Mr. Combs. He originated and operated, both as engineer and announcer, the radio station now known as CBY; he held a certificate from the United States Government as chief engineer for all vessels; and his ability as a fisherman was recognized by the Union Pacific and Frisco railroads who employed him as a scout to explore lakes and streams for fishing possibilities. Mr. Combs had an observatory at his summer home and was secretary of the Royal Astronomical Society in Canada. He also was an authority and collector of United States Stamps, had acquired a valuable collection of rare Oriental rugs, and was the possessor of the finest collection of semi-precious stones in Canada.

Mr. Combs was born 65 years ago in St. Louis, Mo. His early career was journalistic, and he was known as the first staff photographer on an American newspaper. He entered the electrical field as a theatre electrician, and later shifted to the storage battery and accessory field. Affiliated with the Prest-O-Lite Co. since 1905, he introduced his company's products in Canada in 1917. Mr. Combs also was affiliated with the Canadian National Carbon Co., Ltd., and Ditchburn Boats, Ltd.

SAE vice president in 1916, Mr. Combs also served the Society as chairman of the Indiana Section, founder and first chairman of the Canadian Section, a member of the National Membership and Sections Committees, and as a member of the electrical equipment division of the Standards Committee.

Many members of the Canadian Section paid tribute to Mr. Combs at his funeral. Pallbearers were Canadian Section Chairman Norman Daniel, Chairman-Elect R. W. Richards, and Past-Chairmen Alex McArthur, C. E. Tilston, Neil Petersen, and Marcus Brown.

Col. Oliver Brunner Zimmerman

Col. Oliver Brunner Zimmerman died on May 10. He was 67 years of age and had been a member of the Society since 1920. He was SAE vice president representing Tractor engineering in 1925, and was long active in the work of SAE Standards Committees. In 1937, Col. Zimmerman was special representative for the SAE Production Activity.

Honors accruing to Col. Zimmerman included life membership in the Society, presented for his SAE activities and his contributions to the industry; the Cyrus Hall McCormick Gold Medal, presented last year by the American Society of Agricultural Engineers, and the honorary degree of Sc.D., bestowed in 1919 by the Pennsylvania Military College in recognition of his war and scientific work.

After attending the University of Wisconsin on a $1000 scholarship, and receiving his B.S. and M.E. degrees from that institution, Col. Zimmerman started on a teaching career. His industrial work began in 1905, leading him to International Harvester Co. in 1911, with which he was affiliated (except for the World War period) until his retirement in 1933. At that time he was supervisor of the materials and standards division. Following his retirement, Col. Zimmerman practiced as consulting engineer and for a year was research associate at the University of California College of Agriculture.

During the World War he served as a captain and later as a major engaged in duties related to the U. S. Engineer Mobile Army and Coast Defense. In 1924 he was commissioned lieutenant-colonel in the Officers' Reserve Corps.

Charles B. Jahnke

Charles B. Jahnke, an active member of the SAE since 1933, died suddenly, May 6, at Mount Vernon, Ohio, following a heart attack. At the time of his death, Mr. Jahnke was president and general manager of the Cooper-Bessemer Corp. at Mount Vernon. He was 54 years old.

After receiving his M.E. degree at the University of Cincinnati in 1910, Mr. Jahnke joined Fairbanks, Morse & Co. He was associated with this company from 1910 to 1933, first as works manager and later as director of engineering. In 1933 he became affiliated with International Harvester Co., Chicago, Ill., as research engineer and held this position for three years. He then became executive engineer of Cooper-Bessemer Corp., remaining with this company until his death.

Mr. Jahnke was active on the Diesel-Engine Division of the SAE Standards Committee from 1933 to 1936, and on the SAE Diesel-Engine Activity Committee from 1933 until his death.

Fargo President Tells of U. S. Army Truck Program

▪ *Canadian*

"Now that our Lease-Lend plan is no longer a theory but a fact – a fact already expressed in action and bearing fruit – may we in the United States acquit ourselves as well (as the British Commonwealth of Nations) and stand shoulder-to-shoulder in our common cause against aggression," said R. L. Biggers, president, Fargo Division, Chrysler Corp., in addressing the Canadian Section's Windsor meeting, April 18.

Launching his talk on "The Motor Transport in the U. S. Defense Program," Mr. Biggers pictured the accelerated activity of the American automobile industry in production of military vehicles. The United States Army, he said, had only 11,600 trucks in 1937; on July 1, 1941, the figure will be 186,000, and the schedule calls for production of another 100,000 during the remaining six months of the year to bring the total to 286,000 by January, 1942. He remarked further that in 1934 when the first multi-wheel-drive trucks were furnished to the Army by a quantity producer they came off the line at the then unprecedented rate of 35 per day; now, three manufacturers in the ½-ton, 1½-ton and 2½-ton fields are producing at the rate of 700 per day.

Tracing the development of the defense program for motorized equipment, Mr. Biggers gave particular credit to the commanding officer and engineering staff of the Army's Holabird Quartermaster Depot, to whom was given the responsibility of military vehicle development and coordination. These men, he said, studied both the Army's and the industry's problems and became, in effect, "the Army's representatives with the automotive industry, and the industry's representatives with the Army."

With full recognition of the importance of standardization, Mr. Biggers said, the Army developed five basic trucks, to which has recently been added a sixth. Some other units are required for specialized uses, he noted, adding, "but these six types form the basic motorization of the Army and, by trying to limit their procurement to two sources on each type, the Army has attained a high degree of standardization for both procurement and maintenance."

The basic types were listed as: the ¼-ton 4x4 "Jeep" or "Blitz Buggy"; the ½-ton 4x4, equipped with six body types, each serving a different purpose; the 1½-ton 4x4 with two body types, dump and cargo; the 2½-ton 6x6; the 4-ton 6x6, and the 6-ton 6x6.

One of the big problems, Mr. Biggers stated, is the training of drivers, mechanics, and specialists to operate and maintain the 286,000 vehicles. To supplement their own schools, the Army is utilizing civilian trade-school facilities for the training of the specialists, and has turned to the vehicle manufacturers for support in training the motor-vehicle maintenance men. "In the past," he said, "our organization alone (Chrysler) has conducted 2- to 10-day schools in the field covering the maintenance of our vehicles and, in this way, have assisted in the training of more than 3000 officers and men. At the present time a Mechanics Training School is being operated out of Fort Wayne (Detroit), where each week a new class of 30 officers from the Using Arms of the service comes in for a 4-weeks training. This training is carried out by the four major suppliers in this area – Ford, G.M.C., Chevrolet and Chrysler."

Windsor Regional Vice Chairman E. A. Souliere presided at the meeting. More than 300 attended, including members and their friends from a dozen Canadian centers and guests from the United States. Prior to the meeting, Mr. Biggers and several Canadian Section members witnessed accelerated war activity at Canadian Ford and Chrysler plants. Commenting on his tour, Mr. Biggers told the Canadian engineers: "Your accomplishments in manufacturing flexibility and ingenuity hang up a great record and a challenge."

Praises American Engineering Ability

▪ *Dayton*

Don't sell America's engineering ability short, urged SAE President A. T. Colwell, vice president, Thompson Products, Inc., in addressing a joint meeting of the Society's Dayton Section and the Dayton Chapter of the American Society of Tool Engineers on May 12. Conceding that American industry was slow in getting underway on defense orders, he said that we are doing a fine job now and by the end of this year huge quantities of the finest military equipment will be available.

Germany, Mr. Colwell stated, started developing its military production in 1933, and in six years had increased its aircraft production from 10 per month to 2000 per month, and other articles in proportion. While it is claimed that the German army is the strongest in the world, he said, it is doubtful that it will be by the end of the year.

Much of the material Mr. Colwell presented has been covered in SAE Journal reports of his earlier talks before other Sections of the Society. After he had finished his formal presentation, Mr. Colwell answered a barrage of questions from the floor.

Traces Diesel Lubrication Troubles to Human Errors

▪ *Tulsa Group*

The human element received the blame for many of the diesel lubrication engineer's woes arising in the field, when E. L. Kennedy, Cato Oil & Grease Co., addressed the SAE Tulsa Group, March 7. Sometimes, he said, manufacturers don't take into consideration the abuse to which equipment will be subjected on the road; salesmen oversell the equipment; buyers underestimate the load and operating conditions; service men are too often mere "nut twisters" and not mechanics.

Mr. Kennedy related some experiences in meeting such difficulties when the lubrication engineer has been called upon for a remedy or has been blamed for the resulting trouble.

In certain areas, such as the Midwestern lime-water territories, he said, scale is often deposited in the cooling system, acting as an insulator and resulting in a reduction in the heat exchange, sometimes bringing the temperature of the cylinder wall above the flash point of the lubricating oil. Difficulties result, and the oil is blamed. Mr. Kennedy suggested revision of cooling system design to overcome this difficulty.

Lack of knowledge of fuel by the operator is the basis of many lubrication problems, he stated, and deplored that standardization of fuel is a long way from being a fact "regardless of what we in the oil industry might say in our advertisements and sales talks." Operators declare that it is difficult to get any two batches of oil just alike, he said, and added that while color and gravity of different fuels may be practically the same, variation in flash, gum content, or something else develops into trouble.

Mr. Kennedy emphasized that for successful combustion the physical and mechanical conditions of the engine must be right. "A great deal has been said and written about rings sticking," he declared, adding, "yet it is absolutely settled in the writer's mind that improper combustion conditions cause more ring sticking than any other one thing." He also commented that, in his opinion, ring sticking, scuffing, and excessive wear on cylinder walls, pistons and rings may be attributed to faulty combustion in many more cases than to lubrication. In connection with fuel, he also commented that fuel filtration is of far more importance than the operating public seems to realize.

Discussing the diesel-engine manufacturers' practice of listing approved lubricating oils for their engines, Mr. Kennedy

said that it is impossible for him "to reconcile the approvals made by the manufacturers, as they cover practically all types of oil." He asked why they do not set up specifications of the acceptable lubricants for their equipment, rather than list trade marks. The present situation, he said, results in "a lot of headaches." An operator, he continued, will select an approved oil – and then switch to another approved oil of a different type under the influence of a high-pressure salesman. He then discovers that the oil pressure in his equipment drops, or something else happens, and blames the oil for the difficulty, Mr. Kennedy stated.

In concluding, Mr. Kennedy listed the functions of a diesel lubricant as: lubrication, cooling, and scavenging the residue of the fuel.

Aircraft Engineers Give Spot-Welding Figures

▪ So. California

Mrs. Mabel Rockwell, research engineer, Lockheed Aircraft Corp., was lead-off speaker at a four-paper symposium on "Application of Spot Welding to Aircraft Production," sponsored by the Southern California Section at Santa Monica, April 18. Others on the panel were John Oberholtzer, research engineer, North American Aviation, Inc.; O. A. Wheelon, production design engineer, Douglas Aircraft Co., and E. S. Dibble, resistance welding engineer, General Electric Co. Foster Gruber organized and directed the meeting, E. F. Burton was toastmaster, and C. L. Johnson, served as technical chairman. Attendance passed the 300 mark.

Commenting on the work Lockheed is doing with the roll-type welder, Mrs. Rockwell declared that they have found an output of 30,000 average or 40,000 maximum spots per 8-hr shift possible, at a minimum cost of approximately 0.05¢ per weld. She said that they are using the Sciaky or stored-energy type equipment to maintain line voltages, as are most of the present operations. In connection with her paper, Mrs. Rockwell had shown a number of photomicrographs of spot welds, arc welds and flush riveting, illustrating how favorably spot-welded joints compare in strength with riveted joints.

Cost figures on fixed-electrode type welders as compared with hand and automatic riveting were presented by Mr. Wheelon. While either one or the other might have an economic advantage on specific jobs, he said, the welded joints are usually about as cheap as the rivets. Douglas, he revealed, has counters to register the spots made with each of their 14 machines, and has found that approximately 2100 spots are made per 8-hr. shift, at a cost of 0.79¢ per spot, including all overhead costs.

Mr. Oberholtzer discussed some of the mechanical difficulties encountered with spot welding and spoke particularly of trouble experienced with cooling electrode tips. He also explained the plant rearrangement necessary when resistance welding is introduced, and stated that at times it is best to locate the equipment overhead to minimize the hauling of materials.

A brief illustrated description of the more recent developments in resistance-welding controls was given by Mr. Dibble, who spoke particularly on the set-up and operation of the General Electric thyratron synchronous control which indicates good and bad welds as they are made.

Open discussion brought general agreement that to get fully comparative costs between spot welding and riveting, the figures should be based on the cost of an assembly designed for spot welding compared with a like assembly designed for riveting, rather than the cost per single spot or rivet.

The biggest drawback to spot welding, it was agreed, is that it has been applied to structures designed for riveting.

Flint Members Sponsor Meeting; Kunkle Speaks

▪ Detroit

Flint was host to some 400 members and guests from that city, Detroit, and nearby sections at a special meeting arranged by a committee of SAE Members in the Flint area, April 15.

Principal speaker of the evening was Bayard D. Kunkle, vice president in charge of personnel for General Motors Corp., whose topic was "The Relation Between Engineering and Production." Himself an engineer and a production executive, Mr. Kunkle declared that the first objective of an engineer is to provide a design that will satisfactorily do its required job. The engineer's problem can be approached in two ways, he declared, stating: "the first is purely that of seeking a satisfactory answer to an existing problem with little or no regard for a solution from the standpoint of its manufacturability. The second is to consider the engineering job from the standpoint of how the device or improvement can be developed to lend itself to the simplest and most efficient manufacturing processes." He said that he has observed that engineers who have "a good grasp of the problems in manufacturing" are the most successful.

Mr. Kunkle's paper is published in full in this issue, starting on page 15.

Hufstader Coffee Speaker

"Coffee speaker" at this meeting was W. F. Hufstader, vice president and general sales manager of Buick. His talk was titled "A Sales Manager's Letter to His Son." In it he urged the young man to study engineering because "an engineering course leaves you in an exceedingly flexible position" in regard to selecting a career. "There is a singleness of purpose and an exactness of execution (in an engineering course) unmatched in any other course," he declared.

"At the moment most emphasis is being given to the creation of destructive forces," Mr. Hufstader said, adding, "there will come a day when the emphasis will be on the constructive side of the picture. To be ready, as you should be by then, to have a real part in that constructive era, should be by all odds an objective worthy of the most that is in you. Put all you have got into the acquiring of a background that will enable you to participate in that constructive era. . . . The very emphasis which is being placed today on youth should thrill the millions of young men who, up to now, have been groping. Much more should be the thrill accruing to the young man who has an opportunity to train himself intelligently and practically to take part in the future of a country which so definitely holds the balance of constructive power."

Among those present at the meeting as guests were: John A. C. Warner, SAE secretary and general manager; Harlow Curtice, president and general manager of Buick; and Arnold Lenz, assistant manufacturing manager of Chevrolet in charge of Flint, Saginaw and Bay City plants. L. A. Chaminade, chairman of the Detroit Section, presided at the meeting.

The Flint committee which made all arrangements for the meeting consisted of J. P. Heiss, development engineer, Buick Motor Division, General Motors Corp.; J. R. Emerson, vice president and chief engineer, Marvel-Schebler Carburetor Division, Borg-Warner Corp.; F. C. Pearson, chassis units engineer, Buick Motor Division, General Motors Corp.; C. J. Lauer, experimental engineer, AC Spark Plug Division, General Motors Corp.; and R. B. Schenck, chief metallurgist, Buick Motor Division, General Motors Corp. F. W. Marschner, treasurer of the Detroit Section, served as liaison with the Detroit Governing Board.

Rosen States Objective of Modern Diesel Design

▪ So. California

"Blowby is twice as great during compression as during expansion in modern diesel engines and this excessive fresh air blowing by the rings and pistons is what causes most of our present day troubles." This was one of the potent points made by C. G. A. Rosen, assistant chief engineer in charge of diesel research, Caterpillar Tractor Co., in his paper "High Speed Diesel Engine Development," at the Southern California Section Meeting, May 2.

Supercharging and two-cycling are two methods used for burning more air per cubic inch of combustion space – the aim of present diesel engine design, Mr. Rosen said. Besides covering this subject, the speaker discussed briefly exhaust turbines, Roots type blowers, centrifugal blowers and increasing and decreasing valve overlap on a supercharged engine.

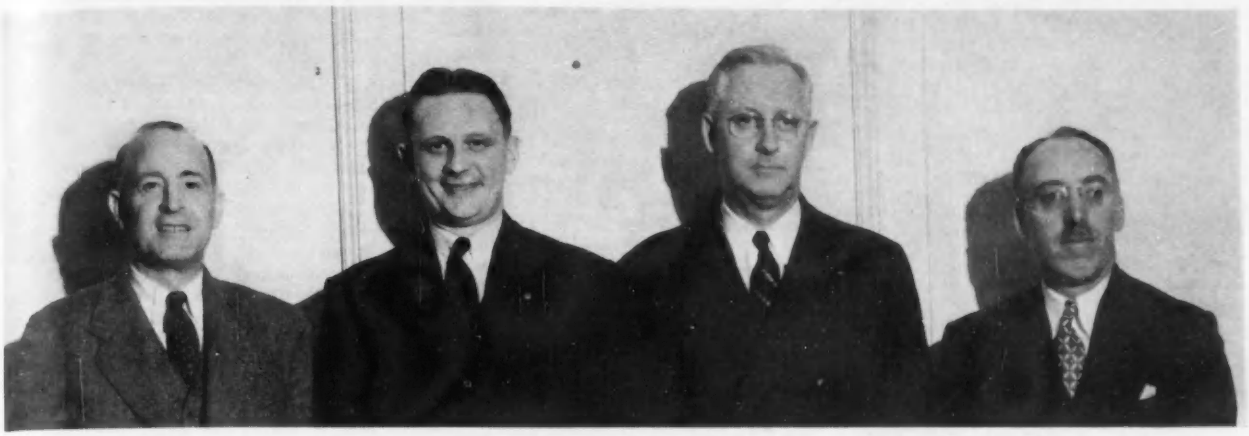
In choosing between two-cycling and supercharging one finds many claims made for both methods, Mr. Rosen pointed out. However, he continued, each has its most advantageous application. The four-cycle supercharged engine has been found most adaptable for designs where size and weight are not the greatest factors, he said. It has been found that supercharging a standard four-cycle engine will increase its output from 20 to 35%, Mr. Rosen stated, while in special engine designs this increased output may be as high as 80%.

The two-cycle engine is desirable for many applications due to its inherent higher output, higher speed, and lower weight, the speaker said.

The top limit of bmep and speed is the top limit of breathing efficiency of the engine, Mr. Rosen said, and as yet there is no top limit to burning. The above mentioned methods of increasing the amount of air burned per cubic inch of combustion space (supercharging and two-cycling) do so by increasing the breathing efficiency, he stated.

Blowby during compression, Mr. Rosen said, is caused by the ring sitting squarely on the lower edge of the ring land during that process, while during expansion the lower edge of the ring is subject to a fluttering up and down movement. This vertical fluttering, the speaker said, seems very much more pronounced in diesel engines than in spark-ignition engines, and is evidenced by the wavy wear on the ring land.

Varied Topics at Kansas City Section's Spring Meeting



Speakers and chairman at afternoon session. Left to right: W. B. Hoey, C. S. Hansen, who presided, A. W. Lavers and C. M. Larson

Five Speakers Present Papers At Annual Two-Session Event

A HINT that direct use of plastics in national defense products may reach such proportions that it is questionable if material and fabricating productive facilities can be expanded rapidly enough to take care of much conversion of zinc and aluminum die castings into plastics . . . A comment that the annual cost of tractor maintenance exceeds $50,000,000 . . . Data on new extreme-service motor oils . . . Colored moving pictures of the snow cruiser in the Antarctic . . . And a complete story on airline maintenance, were among the highlights of the Kansas City Section's two-session five-paper meeting, April 18.

SAE members came from a wide area to participate in the Section's annual Spring meeting. C. S. Hansen, chairman of the SAE Tulsa Group, presided at the afternoon session, and special guests included A. L. Heintze, chairman of the St. Louis Section, and E. F. Lowe, SAE assistant general manager.

Plastics have been subjected to a barrage of ballyhoo, and much of it has been misleading, said W. B. Hoey, Detroit manager of the Bakelite Corp., first speaker at the opening session. This he blamed on wishful thinking and over enthusiasm. Quoting C. F. Kettering's "You can't conversation an industry into existence; you have got to build it into existence," Mr. Hoey said that he won't contend for a moment that some of the things predicted for the near future won't materialize – but a lot depends upon the interpretation of the words "near future."

Before plastics can be put to any general use on such large articles as airplane wings and automobile bodies, Mr. Hoey explained, a faster and cheaper molding technique must be developed. The prefabricated house, he added, is a simpler problem because it will probably require flat sheets.

The national defense program, he said, will undoubtedly stimulate expansion in the plastics field. This influence comes both directly from the use of plastics in tanks, ships and aircraft, and indirectly from the conversion of zinc and aluminum die castings into plastics. He indicated that the demands for direct uses may so tax material and fabricating productive facilities that it may not be possible to take care of much aluminum and zinc conversion. Other direct uses, he said, will be forthcoming in production of gas masks, gun stocks and ammunition parts.

Mr. Hoey classified the various types of plastic materials, described them, and gave the listening engineers some hints on choosing the right plastic to do the job. "Modern plastics," he said, "offer great possibilities to the engineer but there should always be a reason for using them – beyond just blind enthusiasm. The reason may be 'to gain lightness in weight, inbred color (transparent, translucent and opaque), chemical and corrosion resistance, electrical insulation, elimination of assembly operation, or lower cost."

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From left: Kansas City Section Chairman R. R. Matthews, who presided at the evening session, with Dr. T. C. Poulter and R. A. Miller who presented papers

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A. W. Lavers, chief engineer, Minneapolis-Moline Power Implement Co., the second speaker, stressed the importance of preventive maintenance of tractors. The American farmer, he said, does not operate on a budget system, and any money saved in tractor operation has a direct bearing on his profit or lack of profit.

Tractor Dealer Education

He pointed out that the passing of the blacksmith shop has removed farmers' prime authority for knowledge of implement repair and maintenance, and that they are going to depend more and more on their

dealers for information and advice concerning tractor care. Mr. Lavers then explained his company's program to educate the dealers in performing these services. Two of the most important parts of the plan are a well-illustrated service manual and a set of slides to be used with a prepared lecture at meetings.

Mr. Lavers stressed that "good engineering and good shop work go a long way toward giving the farmer a dependable long-lived tractor. However," he added, "if the user does not properly service the air cleaner, oil filter, and breather, as well as use good fuel and make the necessary adjustments and repairs when needed, the tractor is not going to give this long life with low operating costs, and all this good design and building are put in for no purpose."

Concluding the afternoon session, C. M. Larson, chief consulting engineer, Sinclair Refining Co., gave a brief summary of the present situation in regard to extreme-service heavy-duty oils. Only recently, he said, has it been possible to furnish one lubricant which has anti-ring sticking or detergent properties and which is inhibited against corrosion of bearings and oxidation or lacquer.

Heavy-Duty Oil Benefits

The benefits of such new heavy-duty or extreme-service motor oils, he said, are: to provide satisfactory lubrication, regardless of the severity of service, to all engine parts whether diesel or gasoline; freedom from ring sticking; non-corrosive to bearings and engine parts; non-clogging of oil channels; to keep ring and cylinder wear to a minimum; to reduce piston and liner lacquers; quality not adversely affected by mechanical- or fibrous-type filters or by centrifugal purification; addition of new heavy-duty oil to same used oil shall not cause sludging or adversely affect the quality of the new or used oil; no excessive carbon deposits on any part of the engine; increased number of hours of crankcase oil-drain period; the above qualities rendered to all engines in severe or normal service.

Kansas City Section Chairman Ralph Matthews opened the evening session, following an informal get-together dinner, by introducing Dr. T. C. Poulter, scientific director, Armour Research Foundation, who gave an illustrated lecture on "The Snow Cruiser in the U. S. Antarctic Service Expedition." He also presented moving pictures in color showing the construction of the snow cruiser, its transportation to the Antarctic, and its use there; the first colored moving pictures to be brought from the Antarctic.

"Aviation in itself is not inherently dangerous, but like the sea, it is terribly unforgiving of any carelessness, incapacity or neglect," said Raymond A. Miller, American Airlines, Inc., in emphasizing the importance of "Airline Maintenance," the topic of the final paper, prepared by Mr. Miller in collaboration with J. F. Martin, also of American Airlines.

Stating that the aims of American Airlines' maintenance department are to assure conformance with Government regulations, guarantee safety in operation, keep the airplanes available for schedule a maximum amount of time, keep maintenance costs at a minimum and insure the advance of operating standards, Mr. Miller described the company's maintenance set-up and procedure.

Renewed Activity at Wichita; Officers Named

▪ Wichita

Revival of activity of the SAE Wichita Section was welcomed by more than 100 members and guests who attended the group's April 17 meeting. A temporary organization was set up with T. A. Wells, vice president and chief engineer, Beech Aircraft Co., *chairman;* D. T. Evans, manager, lubricants department, Globe Oil and Refining Co., *vice chairman;* and Mitchell Zurawinski, project engineer, Cessna Aircraft Co., *secretary*. Committees are being established and plans for future meetings and activities are underway.

Raymond A. Miller, American Airlines, Inc., was the speaker, presenting his paper "Airline Maintenance," which is summarized in the report of the Kansas City Section Meeting. Interest in his paper reflected the increasing aircraft activity in the Wichita area. Many of those present are affiliated with Beech Aircraft, Stearman, Cessna and Culver as well as other plane and equipment manufacturers and airline operating companies.

Out of town guests included SAE Assistant General Manager E. F. Lowe, Frank Suess and Robert Best of the Tulsa Group, and C. W. McAllister of the Metropolitan Section. A number of SAE members were guests at a luncheon the day of the meeting sponsored by the Wichita Junior Chamber of Commerce which was addressed by Mr. Miller and Mr. Lowe.

New Aircraft Devices Checked on Airliners

▪ Milwaukee

Because it is impossible for aircraft manufacturers or even the military services to run up a large number of testing hours on new devices, such devices are usually checked on the airliners, provided they have been proven sufficiently reliable to permit installation on such planes, R. D. Kelly, superintendent of engineering research, United Air Lines, told the Milwaukee Section's April 30 meeting which was held in conjunction with the three-day Wisconsin Engineering Conference.

The feathering propeller installations, which were put in use about a year ago, were given more hours on airline planes in less than a month than the manufacturer and government had been able to get on their test propellers in over a year, Mr. Kelly stated. He commented further, that whenever it is necessary to remove a plane from service to make tests, revenue from that plane is lost for the period and depreciation continues at a rate of about $100 per day, making it quite a costly procedure.

Guinea Pigs?

In the United Air Lines' shops at Cheyenne, Mr. Kelly told the Milwaukee Section, there has been constructed a mock-up of the DC-3 planes in which meals will be served to the company executives from the standard airliner-type of kitchen in order to test the quality of foods which are being served passengers on the regular airline runs. Passenger comfort and well-being has been the object of considerable research, he stated.

Turning to fuel, Mr. Kelly said that United Air Lines' planes use 91-octane number gasoline, which is as high as their present engines require. Undoubtedly, he added, higher octane-number fuels will be used as soon as suitable engines are available. Fuel economy, he emphasized, is not of such great importance because of cost as because of the increase in payload gained by reducing the fuel load. To illustrate this, he said that in the case of the DC-3 plane, which has a total useful load capacity of about 8000 lb, there is a 5000-lb load of fuel for a 1000-mile trip; thus a 10% saving in fuel would equal a payload capacity increase of 16 2/3%. United Air Lines, he stated, uses between 12,000,000 and 15,000,000 gal of gasoline per year, and their engines are operating on a fuel economy of about 0.46 to 0.48 lb per bhp-hr.

Mr. Kelly pointed out in particular that the aircraft industry has developed instruments that will indicate to the pilot the exact condition of the entire airplane mechanism. The cab of a modern streamlined train, he noted, has about four gages in addition to the engineer's watch hanging from a nail, while a modern transport plane has about 40 gages in the pilot's cabin. Recording instruments are also being installed, he said, so that there can be a better analysis of the operating conditions of a given plane. There has been such development in aircraft instrumentation, he said, that even though instrument landings have been quite possible in the last several years, its general application has been held up because of the large number of devices available. It is deemed necessary, he said, to standardize on the type of equipment to be used so that all airports and all planes would be using the same type of equipment.

During the course of his talk, Mr. Kelly had shown a number of slides picturing the ice formation on planes. He stressed that ice formation is less serious than formerly, due to the development of "rubber boots" to crack the ice off the edge of the wings, and a de-icer fluid which flows out along the propeller blades and softens the ice forming there.

Entertainment was provided by the Waukesha Motor Co. Glee Club of 40 voices.

Petroleum Industry No Bottleneck, Says Lybeck

▪ New England

"It is a war for and with petroleum – and the industry is ready," Robert F. Lybeck, former chairman of New England Section, told its members April 22.

Mr. Lybeck, who is manager of lubricating oils and aviation sales, Colonial Beacon Oil Co., said that the American petroleum industry is ready today to meet all demands made on it. The potential volume available, he stated, is 18,500,000,000 bbl, and added to that are shale beds that could produce as much more. There need be no fear of any bottlenecks in our defense program or our aid to Britain so far as petroleum is concerned, he declared.

The war in the Balkans, Mr. Lybeck said, was primarily for fuel. He also noted that it has been known for some time that Rumanian wells are not giving the volume of past years. So, he said, the drive is on for Iraq. What is possible now, with the British forces in that section, he commented, is that if the German army gets too close,

the Iraq refineries could be destroyed. They are the key to production and cannot be rebuilt overnight.

Next, Mr. Lybeck turned to aviation and showed films of the different units now being produced in this country. With iso-octane available only in the United States, it makes our supremacy in the air certain, based on planned production, he said. That fuel has made possible the high degree of development in American aviation engines, he added. It was learned by technical inspections of German airplanes brought down uninjured, he reported, that Germany is using fuel as low as 64 octane number.

Mr. Lybeck said that the petroleum industry is removing bottlenecks in other industries. He stated as an example, that toluol, which was not plentiful in the last war, will be available in almost limitless quantities from petroleum.

Livingstone and Moller On St. Louis Program

"Crankcase Lubricants for Fleet Operation," by C. J. Livingstone, Gulf Research & Development Co., and "Some Reverse Phases of Engine Testing," by Joseph A. Moller, The Pure Oil Co., were papers presented at the April 22 meeting of the St. Louis Section. Both speakers dealt with additive-type oils and considerable discussion followed their presentations. More than 80 attended the meeting.

Many "Don't Knows" in Brake-Drum Metallurgy

■ *Pittsburgh*

Declaring that knowledge of both the metallurgy and mechanical properties of brake-drum materials is, at the best, both superficial and scanty, Oliver Smalley, president of Meehanite Research Institute of America, spoke before the Pittsburgh Section, April 22. Sharing the program with him was Harvey J. Lidkea, assistant chief engineer, American Brakeblok Division, American Brake Shoe & Foundry Co., who presented "Brake Lining at Work," a paper prepared by W. A. Blume, president of the division.

"In service," Mr. Smalley said, "a brake drum has to take care of the bulk of the energy converted into heat through conduction, convection and radiation regardless of design. . . . Unfortunately, theoretical formulas for calculation of heat flow and temperature, while possible for laboratory tests, are most difficult to interpret to road service. We do know that the wear of a brake drum is not necessarily simple mechanical disintegration, for electron defraction studies reveal that there may be an actual fusion of the brake drum surface. This is far reaching in its implications, for while many students of brake drums like to report on brake drum temperatures as approximating 400 F and sometimes reaching 1200 F, actually the contacting surface is always considerably higher and more often than not the immediate backing layer will exceed the higher figure.

"Any laboratory study of the physical properties of a brake drum material at ordinary temperature conditions, therefore, has little meaning so far as wear is concerned and is unlikely to be of any help except under conditions where braking is of the mildest type."

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Syracuse – No Appointment
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Washington – L. C. Smith

Balancing "knows" with "don't knows" in the field of brake-drum metals, Mr. Smalley said in part:

"We do know in a general way that the coefficient of thermal conductivity of both cast iron and steel falls rapidly with an increase in temperature, but exact figures for the various kinds of common steels and cast iron are not available. . . . We have in a general way also some knowledge of the specific heat of both steel and cast iron at elevated temperatures, but even this simple property has not been established positively. . . . We know something of the creep strength of certain cast irons and mild steel at the lower temperatures, yet we know nothing of their fatigue or endurance properties at elevated temperatures or the effects of varying conditions of temperature change. . . . Much has been done to attempt to correlate Brinell hardness of a brake drum with its service life and wear-resisting properties, yet we have little or no knowledge of what the Brinell hardness of the actual wearing surface of the drum is likely to be in service.

"A too commonly made statement," Mr. Smalley continued, "is that a 'pearlitic structure' is essential to good wear and to avoid scoring of cast-iron brake drums. This, unfortunately, is a somewhat meaningless expression for pearlite itself is not a simple structure and the matrix of almost any cast iron poured into light brake drums is mostly pearlitic in one form or another. . . ." He also stated that it is questionable whether tensile of itself conveys anything on the performance of brake drums.

Using a number of photomicrographs, Mr. Smalley commented on the various brake-drum materials and the properties of each in meeting common problems, particularly scoring and thermal checking. "The primary considerations of a good brake-drum material," he said in his summary, "are: (1) to select the correct structure in combination with the best mechanical properties for the particular service conditions to be encountered; (2) uniformity – that is, every brake drum must have the same structure regardless of design or dimension.

"In the absence of these, fancy compositions of irons, the indiscreet use of alloys, the claim for high strength tests, and the loose use of metallographic terms are apt to be more misleading than informative."

The tremendous amount of heat generated in braking a car to a fast stop was stressed in Mr. Blume's paper. In bringing a 4000-lb automobile from 60 mph to a complete stop in 4 sec, he said, 618 Btu are developed, enough heat to raise 40 lb of cast-iron brake drums from 70 F to approximately 200 F. It can be seen, he added, that through a succession of closely spaced stops, or through a long dragging braking operation, dangerously high temperatures might be reached.

Factors affecting the performance and life of brake lining, he said, are: braking habits of the driver; maintenance of brake and drum assemblies; gross vehicle weight, and such things as topography road surfaces and climatic conditions.

The bulk of the paper reported current laboratory and road-testing work being done by American Brakeblok at its Detroit plants. Following his presentation of Mr. Blume's paper, Mr. Lidkea gave an extensive blackboard diagrammatic talk on the details of automobile brake engineering.

In discussion, Stephen Johnson, Jr., Bendix-Westinghouse Automotive Air Brake Co., commented that brake-drum design has not kept pace with brake-drum metallurgy. He called attention to the importance of temperature gradients and of restricting brake temperatures by proper maintenance work.

W. Coyle Cochrane, Cities Service Oil Co., noted that in applying brakes, "fanning" them tends to give better distribution of heat than steady application.

The effect of moisture as a cause of brake trouble was mentioned by B. H. Eaton, Bell Telephone Co. of Pa., who said that moisture may transfer rust from the surface of the drum to the lining where it might become imbedded in some porous lining and cause it to glaze or remain on the surface of harder linings and cause less trouble. He recommended snubbing the brakes after driving through water.

1941 SAE Handbook Ready; Obsoletes Other Editions

Just off the press is the 1941 SAE Handbook. Up-to-the-moment, it supersedes all previous editions. Copies have been mailed to all SAE members in good standing.

Thirteen standards are published for the first time in the 1941 edition, and 34 standards have been added to or revised. Some 30 others have been slightly changed to bring them up to date. Deleted from the new edition are 15 standards that have been cancelled, either because they have become obsolete or have been superseded by new standards.

The 1941 SAE Handbook, besides including some 800 pages of standards, complete with tables, charts and diagrams, contains SAE Standards Committee regulations, personnel of the Standards Committee and its divisions, and SAE representation on other organizations.

A special section of the Handbook, starting on page XVII, states briefly the classes of SAE Standards, explains the Society's standardization activities, policies and pro-

(Continued on page 33)

Nutshell of Priorities

First concise, official handbook on how the government is trying to put first things first in production for the national emergency is the 69-page "Priorities and Defense" which warns:

1. Manufacturers should try other reasonable and customary means to solve their problems before asking for priority aid;
2. Producers should schedule with national defense in mind;
3. Full supporting data should accompany application for priority;
4. System is designed chiefly for procurement of defense materials;
5. Military supply problems should be taken up first with Army and Navy; non-military problems appearing to have a connection with primary defense contracts may be taken to Priorities Division.

Booklet available free from Division of Priorities, Social Security Bldg., Washington, D. C.

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To Get Priority

OUT of a plethora of rulings comes this: The Army and Navy Munitions Board assigns preference ratings to all military orders.

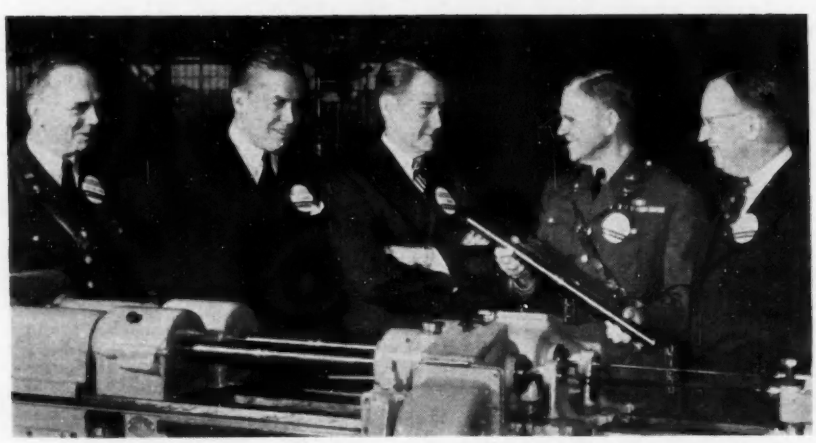
Extensions beyond these ratings go to the Priorities Division, OPM, which on its own authority sets blanket priorities, or makes specific extension beyond these to individual subcontractors who otherwise would become bottlenecks in production.

Form PB 3 is used by the prime contractor; Form PB 4 by the subcontractor in seeking preference ratings beyond those originally set by the government contracting officer. British Purchasing Commission orders take a priority equal to similar products ordered by the U. S. When a manufacturer is faced with a problem of executing a given order where one or more priorities appear to conflict, he can get quick, detailed information from any of the Army Ordnance District Offices:

Boston, Room 1501, 140 Federal St.
Chicago, 6th floor, 38 South Dearborn St.
Cincinnati, Room 831, Enquirer Bldg.
Cleveland, Room 1450, Terminal Tower Bldg.
Detroit, Room 1832, National Bank Bldg.
Hartford, 95 State St., Springfield, Mass.
New York, Room 1815, 80 Broadway.
Philadephia, Room 1300, Mitten Bldg.
Pittsburgh, Room 1202, Chamber of Commerce Bldg.
Rochester, Room 1238, Mercantile Bldg.
St. Louis, Room 935, Federal Courthouse & Custom Bldg.
San Francisco, Room 118, Federal Office Bldg.
Los Angeles, Room 409, Chamber of Commerce Bldg.

Latest detailed information is also available at a number of local Ordnance offices, and from Ordnance inspectors in your city.

New Machine-Gun Plant Dedicated



Defense chiefs look on as Major-Gen. Charles M. Wesson, Chief of Ordnance, U. S. Army, inspects a machine-gun barrel at the dedication of the new machine-gun plant of the Saginaw Steering Gear Division of General Motors

Pictured are: (from left) Major John J. Breen, Detroit Ordnance Department; James D. Mooney, GM vice president; John D. Biggers, production chief, Office of Production Management; Gen. Wesson, and Alva W. Phelps, general manager of the Saginaw Division

Gen. Wesson was heard by SAE members at the National Defense session of the Society's 1939 Annual Meeting. Messrs. Mooney and Phelps are SAE members.

Getting Defense Orders

The present national defense policy, as defined by several high-ranking government officials, the OPM, and procurement officials, is to spread the work.

Even if you have checked with your local Chamber of Commerce or other agencies, it may be good business for you to "present your case" again if you want and think you can execute government contracts, subcontracts, or orders.

MANUFACTURERS interested in national defense orders should avail themselves of one or all of the following sources of detailed information:

1. U. S. Army Ordnance District Office (see left). Each office is eager to know about every manufacturing facility in its district. They do most of the buying for the department, all of the inspection, and will have the latest information about cash advancements, plant additions, machine tool and material priorities.

2. Federal Reserve Banks and Branches, 36 in all (see your own banker for the nearest branch). The office of Defense Contracts Service at each bank is charged with helping prospective manufacturers.

3. Service Information Office, Room 1060, Department of Commerce Bldg., Washington, D. C., is a well-informed agency established to serve you.

NOTE: Be sure to explain in detail *why* you think your company can manufacture needed national defense goods, by answering the following questions:

1. How many years have you been manufacturing?

2. Size of plant in sq ft? Size of warehouse facilities in sq ft? Have you a railroad siding? If not, how far is the nearest to your plant?

3. Have you your own powerhouse? What is its capacity in kwh? If you buy some or all power, how much per week (on the basis of the average of the last 12 months)?

4. Specifically what products are you now manufacturing?

5. What range of steels (SAE numbers), or other materials have you used?

6. What manufacturing machinery do you have:

a. Machine tools; types, makes, numbers of each, and your opinion as to whether each is in "good," "fair," or "poor" condition.

b. Heat treating equipment; types, makes, capacities, and condition of each.

c. General statement of materials handling

equipment, if any. Statement of the number and capacities of motor trucks you own.

6. Do you make your own jigs and fixtures? What tools can you make for your own needs?

7. Current number of employees broken down in groups as follows: (a) Unskilled; (b) Semi-skilled; (c) Skilled; (d) Number of foremen and other supervisory force; (e) Engineers.

8. Is your plant working on the average of 4, 8, 10, 12, or (?) hours per day?

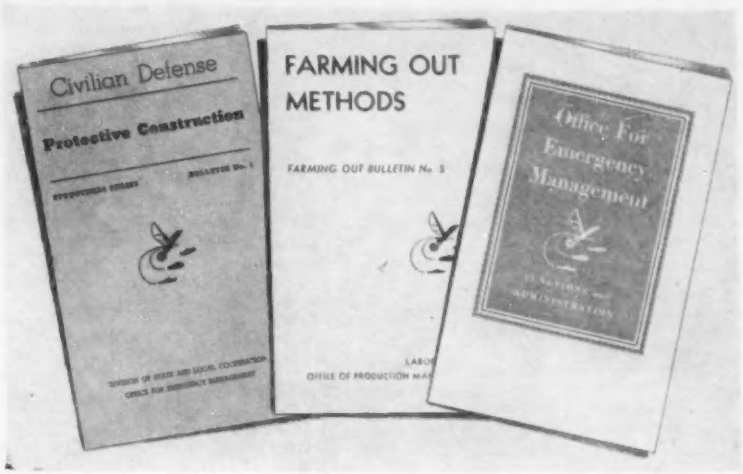
9. Are you equipped for research and development work?

10. What products do you think you could manufacture? And why do you think so?

Inventions for Improving Defense

PEACETIME defense ideas are submitted to the Adjutant General of the Army, to the Chief of the Bureau of Naval Construction, or to anyone whom the inventor can think of – including the President of the United States, mayors of villages and cities, ambassadors, and congressmen.

During the present emergency they are referred to the National Inventors' Council, Washington, D. C., of which C. F. Kettering is the chairman. The board is made up of Army, Navy, and patent-office officials, and a group of civilian engineers. The board is charged with study of the ideas submitted, and in cooperation of the proper defense service determining whether the proposal merits development.



Here are three of the important pamphlets on national defense recently issued from Washington. They are available for the asking: (Left) A compilation of studies of European methods, giving a general background of the problem, bibliography and diagrams. (Write Office of Emergency Management for copies.) (Center) Discussion of the importance of farming out orders, adaptation of old equipment to present emergency uses, and specific examples. (Write to the Labor Division, Office of Production Management.) (Right) An outline of the work of the Office of Production Management, with chart. (Write Office of Production Management, Washington, D. C., for copies.)

Official Answers To Questions

Manufacturers have been asking the Army, Navy, OPM, and various branches of these agencies about specific aspects of national defense business. Asked what questions have been predominant during recent weeks, the following were some reported as typical. With these commonly asked questions are given the official responses which the inquirers are receiving.

Question:

What department of the Army buys the widest range of products?

Answer:

Generally speaking the Quartermaster Corps is the buyer of the largest number of items for the Army. This organization is charged with supplying camps, food, clothing, small-arms equipment, transportation, and the thousands of items involved in equipping and maintaining the Army. Most of the automotive equipment, for example, needed by the Army, is purchased by the Quartermaster Corps to transport troops and supplies.

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Question:

How does the Army buy? or What is the central purchasing agency of the Army?

Answer:

The Army has no centralized purchasing department. Buying is done for each branch of the service by the respective offices of that branch.

Write to the Office of the Air Corps, Chemical Warfare Section, Coast Artillery, Engineers Corps, Medical Department, Ordnance Department, Quartermasters Corps, or Signal Corps *in your territory*. This will avoid the usual delay involved in writing to Washington. Addresses are to be found in your telephone directory, or in the directory of the nearest large city. Your inquiry will be forwarded to District Procurement offices, or will be handled locally, during the present emergency. In peacetime the Army Depots and Arsenals handle most of the requirements, but now the Army is eager to spread purchases as widely as possible.

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Question:

We would like to get technical data about the requirements of the munitions needs of the government?

Answer:

Give reasons *why* you think your company can produce required materials and supplies, if you can. Otherwise, state your experience in manufacturing.

Navy supplies are bought largely by your nearest U. S. Naval District, or Navy Yard.

Ordnance supplies are bought by each District Office.

Lists of each are available by mail from either the United States Navy, or the United States Army, Ordnance Department, in Washington.

These offices have files of drawings, specifications, and other technical data, and have competent engineers to discuss details with potential manufacturers. The larger offices have displays of materials needed for the national defense program – either in scale models, full size, or in photographs.

It is best to explain your plant equipment, size of payroll, products you now make, and capacity, in your first letter asking for an interview.

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Question:

Believing that I am in a position to manufacture automotive equipment for the Army, but not wanting to disclose my ideas indiscriminately, what should I do to make my ideas known to the proper authority? I have considerable plant facilities.

Answer:

First, determine the Army service most interested in your idea. If it is a chemical product – such as a gas, the Chemical Warfare Service would be interested. If it is in connection with trucks, the Quartermaster Corps might be interested. If it has to do with cannon or shells, the Ordnance Department might be interested.

If you are not sure, write the Chief of

Staff, U. S. Army, Washington, D. C., explaining why you think the Army would be interested, what your experience has been in this field, and disclosing your manufacturing capacity and the experience of your technical staff. State that you would prefer to discuss the details with some officer personally, and you will be given an interview. If your idea is patented the government will deal with it as with any other property. If it is not patented but appears to be useful, it will be studied with view of purchase.

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Question:

My company has undertaken an important government contract of national defense products. What steps should I take to prevent sabotage of our engineering department and plant?

Answer:

Ask the inspector assigned to your plant, the contracting officer or agency of the government, or the local office of the Federal Bureau of Investigation. Be sure to indicate any suspicions you may have – this will be of help in securing your plant against sabotage.

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Question:

Does the Army or Navy use the services of commercial testing laboratories? If so, how can our organization obtain government work in this field?

Answer:

The National Bureau of Standards, Bureau of Naval Construction, and the U. S. Arsenals, do a great deal of testing for the government. In special cases the various armed services contract for test work with commercial testing laboratories. The bulk of this work is done by contractors and subcontractors directly through commercial laboratories if the manufacturers have not sufficient facilities, however.

The National Defense Research Committee of the Council of National Defense, Washington, D. C., serves as a clearing house for defense research projects. It allocates specific work to laboratories of known facilities and established reputation.

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Question:

How can I determine the value to the U. S. Navy of a compact heating unit, developed from our experience as an automotive equipment manufacturer?

Answer:

Explain your device fully – if it is patented – to the Commandant of the nearest Navy Yard or Navy District. (Your local newspaper will give you the address.) If it is not patented, either explain it in a letter, or ask for an appointment with a procurement officer. The government seldom undertakes development work of this nature unless the device appears to be of immediate value.

Tin Can Ally

Total annual automotive use of tin could be saved for national defense by a 10% reduction in the thickness of tin coating on cans. National Academy of Sciences told OPM that 12,000 tons could be reclaimed from used cans, but at present, costs of collection, handling and detinning "goat fodder" are unjustified except in cities of large populations. Five plants are detinning flat shop scrap at a profit, however.

Defense-O-Grams

Only the Under Secretaries of the Navy and War Departments can rule that an alien can be employed on a secret contract, or be in that part of the plant where a secret order is being executed, or have access to drawings, specifications or other data concerning such orders.

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Although the use of stop watches to make time studies is prohibited in government arsenals by law, contractors on government orders may use these to establish time as a basis of incentive.

Takes Priority Over Priorities

After months of priority administration by the case-at-a-time method which built up an elaborate structure of detailed orders, products going into military aircraft were granted a special rating on April 29. This is how this blanket rating, issued to aircraft builders, works:

Aircraft builders execute a copy of their priority document and deliver it to their subcontractors, who in turn may issue copies to their suppliers. This cuts through a mass of paper work, implements aircraft manufacture with speed – controlled directly by the aircraft manufacturer. This priority takes priority over former priorities granted. (It is beginning to appear evident that similar blanket priorities will be extended industry-wise on carbon steel to meet emergency needs for freight cars and ships. Automotive consumption of 6,000,000 tons in 1940 equals one-sixth of estimated U. S. use.)

In discussing this new method, Mr. Stettinius urged that aircraft contractors consider other defense orders of their respective subcontractors to effect as smooth a flow of production as was possible.

This policy was used by OPM in March when several machine tool makers were permitted to extend their respective priorities to their suppliers via photostats.

A 'Phone Call Started This

(Long distance phone call less than a year ago – Mr. Knudsen: K. T., will you build tanks?" "Yes, Bill; where can I see one?") Less than a year after that telephone call, the first M-3 medium tank rumbled off the Chrysler $20,000,000 tank arsenal production line.

Major-Gen. Charles M. Wesson, Chief of Ordnance, and K. T. Keller, president of Chrysler Corp., are shown inspecting the 28-ton vehicle, powered by a 400-hp Wright radial engine.

The tank is rated at 25 mph on level terrain, and is said to be capable of 50 mph. The first order for 1000 units totals $33,000,000. This type is armed with a 57 mm (3 in.) field gun, a 37 mm anti-aircraft cannon, two 50-caliber and two 30-caliber machine guns, and a stack of sub-machine guns. It is 18 ft long and over 8 ft to the turret top

(*Continued from page 29*)

cedures, and gives general information on the use of the Handbook.

Members may obtain additional copies of the 1941 SAE Handbook at $2.50 each. The price to non-members is $5.00.

Service Personnel Topic Of Two-Paper Session

■ **Oregon**

"Manufacturers feel that there is a definite lack of adequately trained service men," reported Howard Morse, service engineer, Tracey & Co., in addressing the Oregon Section, April 11, shortly after an extended trip to factory schools in Detroit, Toledo and other industrial centers.

"Many of the things the service man is now working with are intangibles," he said, adding, "and there is a great need for men skilled in the use of accurate testing equipment. The manufacturers' prime interest is in having more men in the field with greater knowledge. Better maintenance means fewer complaints and greater satisfaction."

Speaking specifically on "Training the Future Automotive Technicians," Mr. Morse pointed out that technical and factory schools cover a broad field in a limited time, and for that reason applications of those who have a background of fundamental experience are preferred. In many technical schools, he said, applications must be approved by a district representative before acceptance. The trend is toward putting something physical in the students' hands to supplement theory – and to reduce to a minimum the use of charts, drawings and texts.

"Motor Tune-Ups, Instruments and Men," was the topic taken by Earl Marks, Earl Marks Electric Service Co., the second speaker on the program. He declared that the evolutionary progress in the design and manufacture of automotive vehicles has brought about a revolution in maintenance methods, in maintenance equipment and in maintenance personnel. Furthermore, he said, changes will continue because the engineers, themselves, are not satisfied with the standards of design they already have attained. They will continue to push forward to higher goals of perfection.

Students Present Papers

Honor guests at the Oregon Section's May 9 meeting were the four members of the SAE Student Branch at Oregon State College who were winners of the Section-sponsored annual student technical paper competition.

Authors of each of the prize-winning papers presented them before an audience which included many members of the Student Branch who traveled from Corvallis to Portland for the event.

Fred Morris was awarded the first prize for his paper, "An Examination of Winter Gasolines." Second prize went to Stuart Warren for his paper, "Hydrogenation, Past, Present and Future;" third prize to Dale Miller for his study "Correlation Between the Gum Content of Gasolines and Their Unsaturated Hydrocarbon Content," and fourth prize to Harold Marble for his paper "Application of the Thermal Conductivity Exhaust Gas Analysis to Engines Using Liquefied Petroleum Gas."

Presentation of the technicolor film, "The Gilmore Grand Canyon Economy Run," completed the program.

Lockheed Film Shown At Student Meeting

■ **U. of Wisconsin**

Meeting on April 17, members of the SAE Student Branch at the University of Wisconsin saw moving pictures showing the assembly of the new P-38 and "Hudson" planes being built by Lockheed for the military services. Views of these planes being put through their paces were also flashed on the screen.

Editor's note: A report of the March University of Wisconsin Student Branch Meeting (April SAE Journal, p. 25) quoted F. M. Higgins, advertising manager, Four Wheel Drive Auto Co., as saying that 4-wheel drive trucks equipped with hydraulic couplings "do not operate as well for snow-removal work." A letter from Mr. Higgins advises: "I am sorry that this reference was made as our tests indicate that the hydraulic coupling has considerable merit for this kind of work. At the time I talked to your group, our experience with the hydraulic coupling was very limited and one of the first units in snow-removal work gave some trouble. It was discovered that the difficulty was not in the coupling itself, but in the engine, and as soon as the engine trouble was corrected, the owner was so enthusiastic about the operation of the truck with the coupling in snow-removal service, that he ordered another unit."

T. C. Smith Addresses SAE Club of Colorado

Members of the SAE Club of Colorado heard T. C. Smith, automotive and construction apparatus engineer, American Telephone & Telegraph Co., speak on the design of telephone truck equipment at their May 5 dinner meeting. Mr. Smith, whose headquarters are in New York, visited Denver while on a business trip. Charles Baldwin, who accompanied Mr. Smith on his tour, was also a guest at the meeting.

Drake Addresses Students

A breakfast meeting marked April SAE Student Branch Activity at Oregon State College. Guest speaker was Harley W. Drake, superintendent of equipment, Pacific Highway Transport, who discussed fleet operation on the basis of economics, mechanics and personnel relations. He stressed the importance of the latter. The breakfast meeting was held April 20. Some 20 members attended.

About Authors

(*Concluded from page 13*)

equipment for the Boeing Model 307 airplane. He was vice president and general manager of the Sportsman Aircraft Co., before becoming affiliated with Boeing.

■ **J. L. DILWORTH** ***(J '36), in addition to teaching his regular subjects as instructor in mechanical engineering at Pennsylvania State College, has been assisting as an instructor in an emergency defense training course in diesel engineering for Naval officers. His membership on the Penn State faculty dates from September of last year. Prior to that he held an instructorship in the mechanical engineering department of his Alma Mater, Virginia Polytechnic Institute, while at the same time earning his M.S. degree. Before starting teaching, Mr. Dilworth had experience as junior engineer in the Packard experimental dynamometer laboratory and as assistant supervisor of automotive equipment for the Virginia Electric & Power Co. He received his B.S. in M. E. from V.P.I. in 1936.***

■ **BAYARD D. KUNKLE'S** ***(M '30) broad engineering and production experience, accumulated while holding increasingly important engineering posts since his graduation from Penn State in 1908, more than qualifies him to expound on the relation between these two vital components of manufacturing. Since December of last year, Mr. Kunkle has been vice president of General Motors in charge of personnel. Prior to that, he was vice president in charge of the GM accessory group, director of the manufacturing staff and a member of the corporation's administrative committee. His earlier experience includes presidency of Delco Products, executive engineering and production posts with Frigidaire, Delco-Remy, and Remy Electric, and with Westinghouse Electric and Caskey-Dupree. Through the World War he served as chairman of the manufacturers' committee of the Grenade Association.***

■ ***Highspots in*** **H. W. GILLETT'S** ***professional career include: a summer job in the laboratory of Thomas A. Edison; chemical work with A. D. Little; metallurgical work with the Aluminum Castings Co.; a dozen years with the U. S. Bureau of Mines on non-ferrous problems and during the World War, on utilization of low-grade manganese ores; five years as chief of the Division of Metallurgy, National Bureau of Standards, and the last 12 years with Battelle Memorial Institute, where he is chief technical adviser.***

■ **PETER F. ROSSMANN** ***(M '35) acquired his production and engineering experience in the automotive industry. His original contact with aviation was in conjunction with the tooling program on the Packard-Diesel aircraft engine. Mr. Rossmann held the post of design engineer with Packard when he left there late in 1936 to join the Curtiss Aeroplane Division of Curtiss-Wright Corp., as design engineer. He was named development and research engineer in November of last year.***

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between April 15, 1941, and May 15, 1941.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section

Christmas, John Kay (S M) Lieut. Col., U. S. Army, Ordnance Department, Aberdeen Proving Ground, Md.

Johnson, William B. (S M) Lieut. Col., U. S. Army, Quartermaster Corps, Holabird Quartermaster Depot, Baltimore.

Wolf, Irvin Otto (A) lubrication engineer, American Oil Co., 1001 Eastern Ave., Baltimore.

Canadian Section

Donaldson, George Ronald (A) assistant sales manager, B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont. (mail) 280 Church St., Toronto, Ont.

Chicago Section

Braker, Elmer A. (M) sales engineer, International Harvester Co., Inc., 180 N. Michigan Ave., Chicago.

Bryant, Elmer J. (M) district manager, Greenfield Tap & Die Corp., Greenfield, Mass. (mail) 611 Washington Blvd., Chicago.

Churchill, H. E. (M) assistant research engineer, Studebaker Corp., South Bend, Ind. (mail) 726 E. Eckman St.

Figlewski, Benjamin (M) dynamometer engineer, Sinclair Refining Co., East Chicago, Ind.

Halvorsen, Harry (A) fleet supervisor, Curtiss Candy Co., 622 Diversey Parkway, Chicago.

Lundberg, Russell (M) district supervisor, National City Lines, Inc., 20 N. Wacker Drive, Chicago.

Mandt, Conrad I. (M) engineer, International Harvester Co., Tractor Works, 2600 W. 31st Blvd., Chicago (mail) 5259 S. Monitor Ave.

Shaw, Raymond (A) president, Chek-Chart Corp., 624 S. Michigan Ave., Chicago.

Whitehead, Willard J. (M) assistant chief engineer, Woodward Governor Co., Rockford, Ill. (mail) 811 Lundvall Ave.

Cleveland Section

Beaton, Donald E. (A) charge of manufacturing and production of aircraft pumps and experimental motor parts, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland.

Brezina, Andrew Joseph (J) service engineer, Thompson Products, Inc., 2209 Ashland Rd., Cleveland (mail) 6212 Brecksville Rd., Independence, O.

Buchanan, Walter I. (M) sales engineer, Monmouth Products Co., 1931 E. 61st St., Cleveland.

Dallow, Thomas Peter (J) draftsman, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland (mail) Maple Lane, Aurora, O.

Gilchrist, Albert D. (J) assistant engineer, Leece-Neville Co., 5363 Hamilton Ave., Cleveland.

Henderson, Lester J. (A) assistant manager, aviation division, Weatherhead Co., 300 E. 131st St., Cleveland (mail) 1114 Belvoir Blvd., South Euclid, O.

Hilf, Arthur G. (J) diesel engineer (experimental), Hercules Motors Corp., 11th St., S. E., Canton, O. (mail) 1417 Ohio Ave., N.E.

Johnson, Paul P (M) patent engineer, Thompson Products, Inc, 2196 Clarkwood Rd., Cleveland.

Lauck, John A. (J) chief test engineer, Pump Engineering Service Corp., 12910 Taft Ave., Cleveland (mail) 1342 Winston Rd., South Euclid, O.

Lusty, Cameron Nathaniel (J) stress analyst, Taylorcraft Aviation Corp., Alliance, O. (mail) 122 Rice St.

Lyon, Walter E. (M) development engineer, Firestone Tire & Rubber Co., Akron, O.

Manning, Louis (J) experimental tester, Hercules Motors Corp., Canton, O. (mail) 304 Reno Court, N.W.

Nagy, Henry Theodore (J) engineer, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland (mail) 13504 Sixth Ave., East Cleveland.

Oswald, R. Z. (A) business manager, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland.

Prince Warren V. (J) tool development engineer, Thompson Products, Inc., 2196 Clarkwod Rd., Cleveland.

Selyem, Edwin J. (M) charge of unit engineering, White Motor Co., Cleveland (mail) 5311 Dolloff Road.

Detroit Section

Bolton, Smith (A) sales manager, U. S. Graphite Co., Holland Ave., Saginaw, Mich.

Diederich, John W. (M) federal transport engineer, Chevrolet-Central Office Division, General Motors Corp., General Motors Bldg., Detroit (mail) 18784 Saratoga Blvd., Birmingham, Mich.

Edington, Jack L. (A) salesman, Thompson Products, Inc., 7881 Conant Ave., Detroit.

Feldman, Irving I. (M) designer, Chevrolet Engineering Division, General Motors Corp., Detroit (mail) 18420 Woodingham Drive.

Franklin, Floyd A. (M) electrical engineer, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co., South Blvd., Pontiac, Mich. (mail) 1721 Winthrop Lane, Birmingham, Mich.

Glezen, William Marshall (M) experimental engineer, Monroe Auto Equipment Co., Monroe, Mich.

Mara, Wm. A. (A) general sales manager, Stinson Aircraft Division, Vultee Aircraft, Inc., Wayne, Mich.

Matheny, Harry R. (M) vice president, operating manager, Highland Park Plant, Chrysler Corp., 341 Massachusetts Ave., Detroit.

Nolan, Edmund T. (J) purchasing agent, Advance Stamping Co., 7075 Lyndon, Detroit.

Reed, Howard G. (M) designer, Packard Motor Car Co., Detroit (mail) 216 McKinley Rd., Grosse Pointe Farms, Mich.

Ruhl, Fremont F. (A) sales development engineer, U. S. Graphite Co., 1621 Holland Ave., Saginaw, Mich.

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Southern California Section

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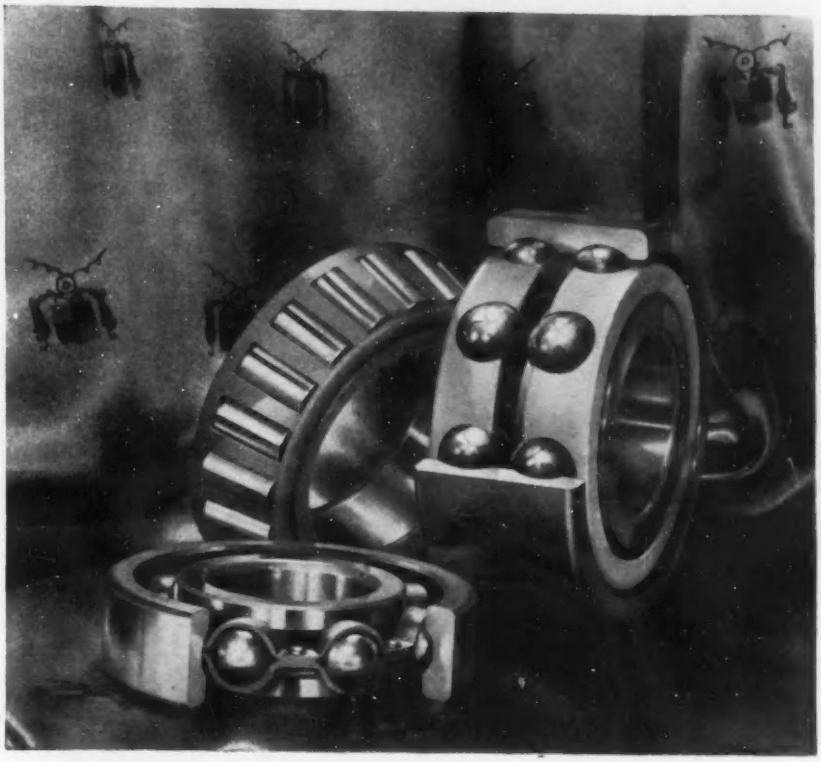
Billings, **Samuel P., Jr.** (A) supervisor



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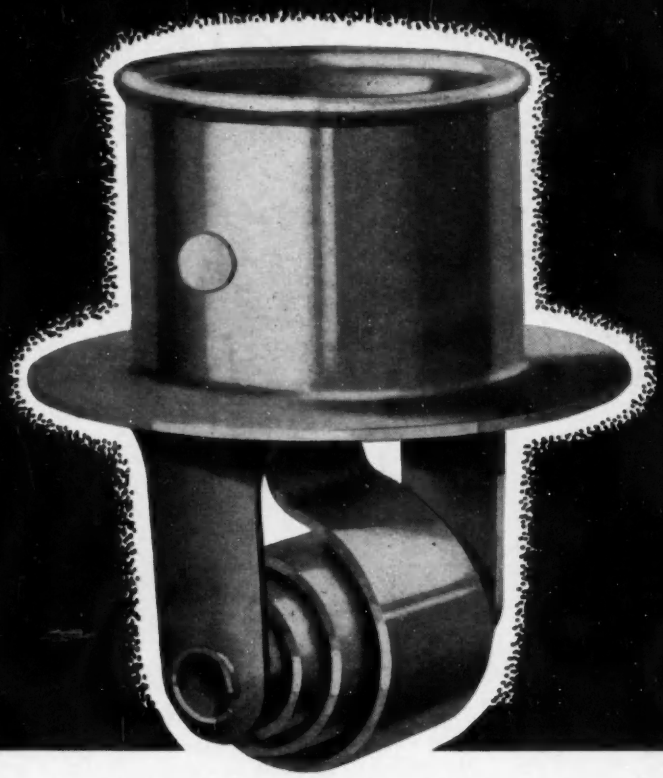

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Bachman, Oscar L. (A) application engineer, American Bosch Corp., Springfield, Mass. (mail) Hotel Charles.

Hunsaker, James Peter (J) engineering draftsman, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. (mail) Town Woods Hill, Glastonbury, Conn.

Shepard, Amos Edward (M) designer, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. (mail) 1783 Main St., Glastonbury, Conn.

United Aircraft Corp. (Aff.) 400 S. Main St., East Hartford, Conn. Representatives: **Baker, Paul S.,** head, aerodynamics and flight test section, Vought-Sikorsky Aircraft Division, Stratford, Conn.; **Campbell, Paul J.; Eaton, Edwin D.,** assistant engineer, Hamilton Standard Propellers Division; **Parkins, Wright A.,** assistant chief engineer, Pratt & Whitney Aircraft Division; **Willgoos, Andrew V. D.,** chief engineer, Pratt & Whitney Aircraft Division.

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Farley, T. R. (A) vice president, Caterpillar Tractor Co., Peoria, Ill.

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Scheumann, Walter W. (M) chief chemist, refining division, Cities Service Oil Co., Bartlesville, Okla.

Shirley, Wilson S. (A) district manager, Fafnir Bearing Co., New Britain, Conn. (mail) 2825 Commerce St., Dallas, Tex.

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Trautteur, Amedeo, Dr. (F M) manager, Compagnie Italiana Westinghouse, Freni & Segnali, Torino, Italy (mail Via Aldo Campiglio 21).

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APPLICATIONS Received

The applications for membership received between April 15, 1941, and May 15, 1941, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section

Wilemon, William K., Captain, Quartermaster Corps, U. S. Army, Headquarters Third Corps Area, Baltimore.

Buffalo Section

Sommer, Eric E., chemical engineer, The Linde Air Products Co., Tonawanda, N. Y.

Canadian Section

Allcock, Frederic, vice president in charge of manufacturing, Thompson Products, Ltd., St. Catharines, Ont., Canada.

Holesek, Martin A., designer and layout man, General Motors of Canada, Ltd., Oshawa, Ont., Canada.

Leach, Jack Reginald, assistant secretary-treasurer, Thompson Products, Ltd.. St. Catharines, Ont., Canada.

Nosotti, Andrew, engineer, Chrysler Corp. of Canada, Ltd., Windsor, Ont., Canada.

Paupst, M. P., assistant service manager, Ford Motor Co. of Canada, Ltd., Regina, Sask., Canada.

Chicago Section

Barker, Henry Thomas, technical manager, Borg & Beck, Division Borg-Warner Corp., Chicago.

Cernota, Henry P., garage foreman, maintenance, Arthur Dixon Transfer Co., Chicago.

Stoffle, N. Neal, engineer, United Air Lines Transport Corp., Chicago.

Cleveland Section

Bauer, John W., chief engineer, Reid Products, Division The Standard Products Co., Cleveland.

Clark, Charles William, chief draftsman, Cleveland Steel Products Corp., Cleveland.

Davidson, Charles L., assistant sales manager, Thompson Products, Inc., Cleveland.

Giese, Carl R., carburetor and ignition engineer, White Motor Co., Cleveland.

Syvertsen, Edwin T., sales manager, service division, Thompson Products, Inc., Cleveland.

Tobin, Paul E., sales manager, White Motor Co., Cleveland.

Van Hoozer, Flayle Levoyde, inspector, Cleveland Tractor Co., Cleveland.

Dayton Section

Berkley, Warren D., detailer, Aeroproducts Division, General Motors Corp., Vandalia, O.

Holliday, Theodore B., associate electrical engineer, Army Air Corps, Wright Field, Dayton, O.

Junker, Alex J., assistant chief engineer, Crosley Corp., Cincinnati, O.

Detroit Section

Baker, Thomas L., assistant to general manager, National Stamping Co., Detroit.

Bealer, Irving Willis, research engineer, General Motors Corp., Research Laboratory, Detroit.

Boales, William G., owner, manufacturers agents, Wm. G. Boales & Associates, Detroit.

Bolton, Harry G., assistant chief engineer, Marvel-Schebler Carburetor Division, Borg-Warner Corp., Flint, Mich.

Cliborn, Robert, engineer, Chevrolet Division, General Motors Corp., Detroit.

Dempsey, Arthur James, II, test engineer, Continental Aviation & Engineering Corp., Detroit.

Huber, Paul, acoustical engineer, General Motors Corp., General Motors Proving Ground, Milford, Mich.

Lutz, Frederick B., salesman, Budd Wheel Co., Detroit.

Nims, Paul Theodore, research engineer, Chrysler Corp., Detroit.

Otis, J. Hawley, accessory sales manager, Pontiac Motor Division, General Motors Corp., Pontiac, Mich.

Thomas, Edmund A., sales engineer, Thompson Products, Inc., Detroit.

Indiana Section

Dougherty, Floyd G., Allison Division, General Motors Corp., Indianapolis.

Harvey, Robert R., general draftsman, Allison Division, General Motors Corp., Indianapolis.

Kaeuper, Eugene C., draftsman, Allison Division, General Motors Corp., Indianapolis.

Kansas City Section

Davis, Gilbert C., president, Stewart-Warner Alemite Co., Kansas City, Mo.

Tobin, Frank E., aviation engineer, The Texas Co., New York. Mail: Phillips Hotel, Kansas City, Mo.

Metropolitan Section

Fedorowski, Joseph G., design engineer, Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y.

Glover, John E., Jr., design engineer, Republic Aviation Corp., Farmingdale, L. I., N. Y.

Kalmin, Samuel, fleet superintendent, Hygrade Food Products Corp., Newark, N. J.

Kirchner, Otto E., chief engineer, American Airlines, Inc., Jackson Heights, L. I., N. Y.

Kruk, John M., designer, Breeze Corporations, Inc., Newark, N. J.

Meyers, Willard F., layout draftsman, Wright Aeronautical Corp., Paterson, N. J.

Nogueire, Henry Roussell, service representative, Foreign Distributors Division, General Motors Corp., New York City.

Pope, John Clifford, department manager, Ethyl Gasoline Corp., New York City.

Sheets, Jack H., project engineer, Curtiss Propeller Division, Curtiss-Wright Corp., Caldwell, N. J.

Soverel, Malcolm C., standardization engineer, Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.

Speas, R. Dixon, assistant to chief engineering pilot, American Airlines, Inc., Jackson Heights, L. I., N. Y.

Van Valkenburgh, Hugh, student engineer, Ranger Aircraft Engines Division, Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

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Milwaukee Section

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New England Section

Billings, William E., home office fleet engineer, Liberty Mutual Insurance Co., Boston.

Holmquist, Richard, motor analysis and tester, Cadillac Automobile Co. of Boston, Boston.

Jordan, Henry Robert, Hyannisport Garage, Hyannisport, Mass.

Northern California Section

Johnston, Thomas, Jr., salesman, Rio Grande Oil Co., Oakland, Calif.

Northwest Section

Peterson, Gerald A., mechanical engineer, Boeing Aircraft Co. Seattle, Wash.

Philadelphia Section

Moore, Clarence W., chief engineer, United Specialties Co., Mitchell Division, Philadelphia.

Pittsburgh Section

Raspet, Robert M., automobile mechanics' instructor, National Defense Training, Connelley Vocational High School, Pittsburgh.

Southern California Section

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Reid, Brian, director of vocational education, Oceanside Junior College, Oceanside, Calif.

Southern New England Section

McCarthy, Calvin Deane, test engineer, Hamilton Standard Propellers Division, United Aircraft Corp., East Hartford, Conn.

Van Dorn, Horace B., engineer, The Fafnir Bearing Co., New Britain, Conn.

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Raabe, Norman C., automotive engineer, Federal Security Agency, Civilian Conservation Corps, Washington, D. C.

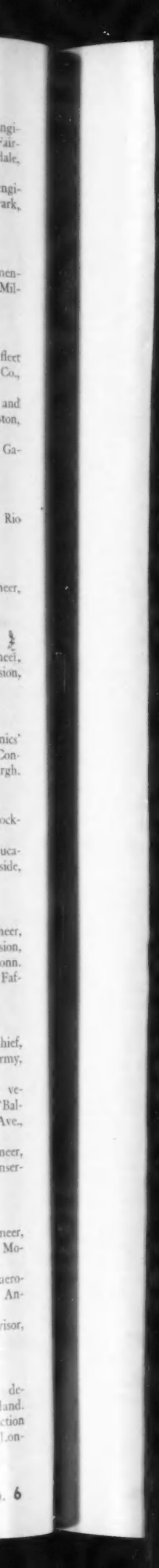
Outside of Section Territory

Gladden, Charles A., Jr., test engineer, Aircraft Engine Division, Continental Motors Corp., Muskegon, Mich.

Peterson, Thoburn F., instructor, aeronautical engineering, Tri-State College, Angola, Ind.

Smith, John Floyd, service supervisor, Toney Chisum, Inc., Amarillo, Texas.

Foreign

Evernden, Harold Ivan Frederick, designer, Rolls-Royce, Ltd., Derby, England.

Thorpe, Frank C., technical production officer, Ministry of Aircraft Production, London, England.